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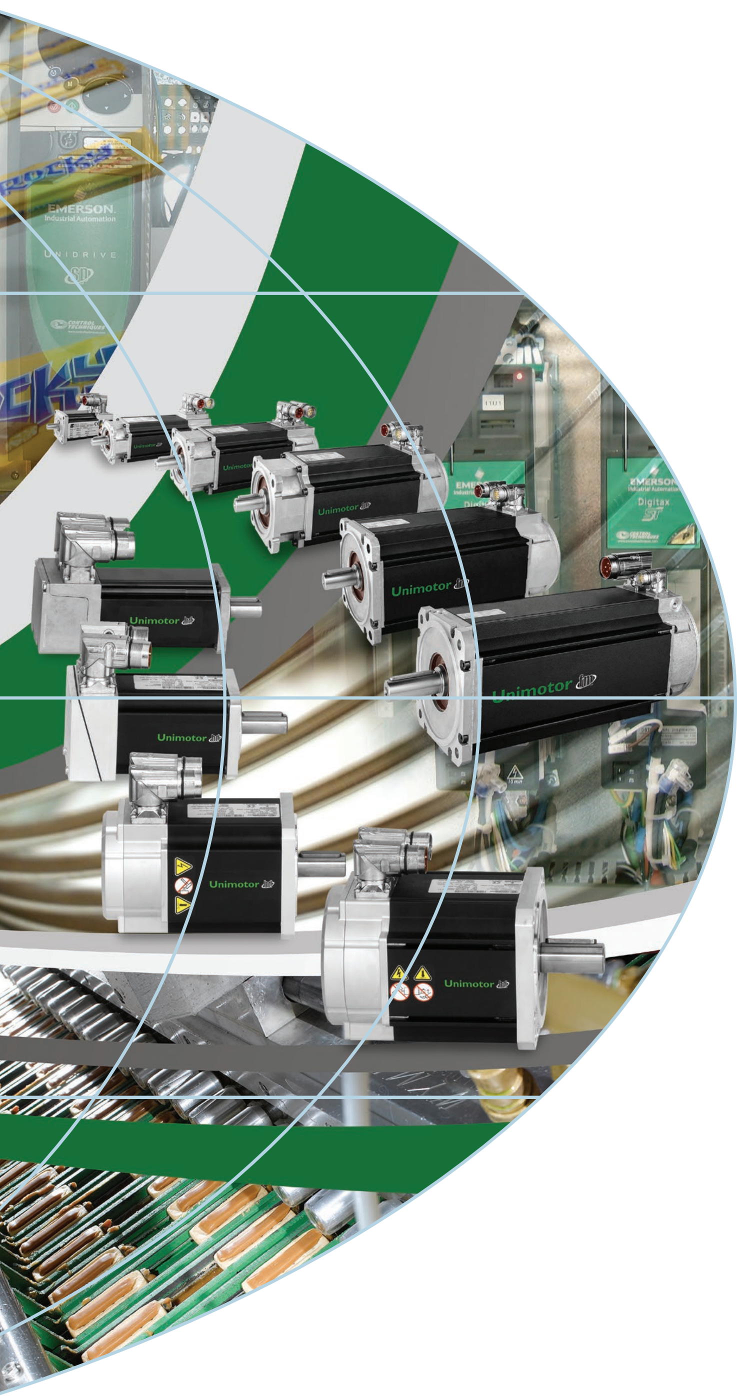

Technical Data

Unimotor fm and hd

High performance AC brushless servo motors

CONTROL TECHNIQUES

Control Techniques Dynamics Limited

Control Techniques Dynamics is renowned for its innovations in the industrial servo, aerospace and defence markets since 1962 and is a member of the Emerson (USA) group of companies.

Our long experience provides a strong base to develop cost effective solutions for a spectrum of applications from machine tools, mechanical handling, pick and place machinery; through to specialised mechanisms a nd actuators for the avionics industry.

Our Research and Development team works closely with leading universities and, using our own proprietary software, designs innovative products for a wide range of demanding environments.

Control Techniques Dynamics offers continuous advances in product range, backed with the expertise and flexibility to meet the demands of your applications - now and in the future.

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1 Introduction to Unimotor fm

1.1 Overview

Unimotor fm is a high performance brushless AC servo motor range matched for use with Control Techniques drives. 'fm' stands for flexible motor, designed to accommodate a wide range of applications. The motors are available in seven frame sizes with various mounting arrangements and motor lengths.

1.1.1 Reliability and innovation

Unimotor fm is designed using a proven development process that prioritises innovation and reliability. This process has resulted in Control Techniques' market leading reputation for both performance and quality.

1.1.2 Matched motor and drive combinations

Control Techniques motors and drives are designed to function as an optimised system. Unimotor fm is the perfect partner for Unidrive SP, Digitax ST and Epsilon EP drives.

1.1.3 Features

Unimotor fm is suitable for a wide range of industrial applications, due to its extensive range of features

- Torque range: from 0.72 Nm to 136 Nm
- Standard and high energy parking brakes
- Numerous connector variants, e.g. vertical, 90° low profile, 90° rotatable and hybrid box on frame size 250
- Variety of flange possibilities (IEC/NEMA)
- Various shaft diameters; keyed or plain
- IP65 conformance; sealed against water spray and dust when mounted and connected
- Low inertia for high dynamic performance; high inertia option available
- World class performance
- Supported by rigorous testing for performance and reliability
- Optional high peak torque motors; up to 5 times stall torque
- Winding voltages of 400V and 220V
- Rated speeds include 1500 rpm, 2000 rpm, 3000 rpm, 4000 rpm, 6000 rpm and others available

1.1.4 Faster set-up, optimised performance

When a Control Techniques servo drive is connected to a Unimotor fm fitted with a SinCos or Absolute encoder, it can recognise and communicate with the motor to obtain the "electronic nameplate" data. This motor data can then be used to automatically optimise the drive settings. This feature simplifies commissioning and maintenance, ensures consistent performance and saves time.

1.1.5 Accuracy and resolution to suit your application requirements

Choosing the right feedback device for your application is critical in getting optimum performance. Unimotor fm has a range of feedback options that offer different levels of accuracy and resolution to suit most applications:

- Resolver: robust for extreme applications and conditions - low accuracy, medium resolution
- Incremental encoder: high accuracy, medium resolution
- Inductive absolute: medium accuracy, medium resolution
- Optical SinCos/Absolute: high accuracy, high resolution
- Single turn and multi-turn: Hiperface and EnDAT protocols supported

1.1.6 Ideal for retrofit

Unimotor fm is an ideal retrofit choice with features to ensure it can integrate easily with your existing servo motor applications. Unimotor fm has been designed so that existing Unimotor customers can easily migrate to the new platform. All connector interface types and mounting dimensions remain the same. If you are planing to retrofit your system, Unimotor fm is the obvious choice.

1.1.7 Custom built motors

As part of our commitment to you, we can design special products to meet your application specific requirements.

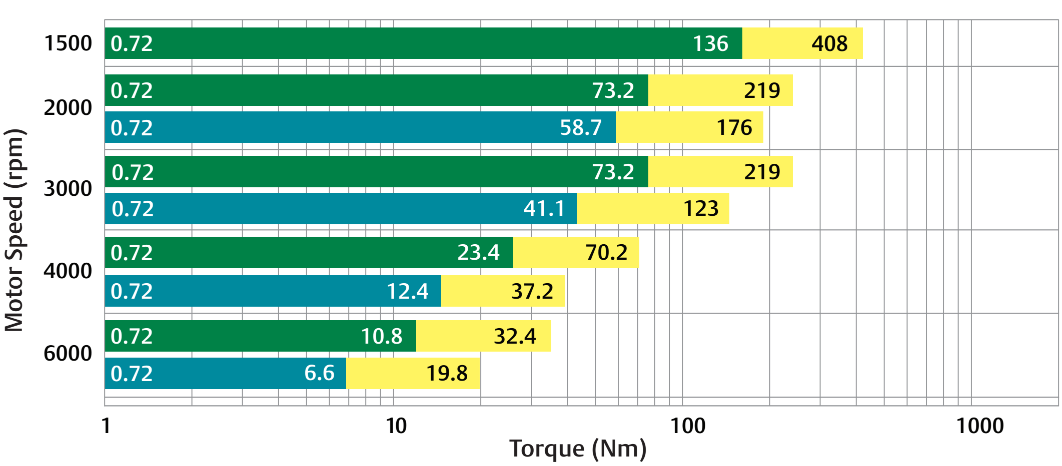
1.1.8 Wide range of accessories

Unimotor fm has a wide range of accessories to meet all your system requirements:

- Feedback and power cables for static and dynamic applications
- Fan boxes
- Gearboxes
- Cable connectors

1.1.9 Torque performance

Peak | Stall at 220V nominal | Stall at 400V nominal



NB: The selection of drive-motor combinations should be based on duty/load profiles of the application

1.1.10 Conformance and standards

RoHS Compliant

FM 30610

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Ordering information

Use the information below in the illustration to create an order code for a Unimotor *fm*

095	U	2	B	30	1	V
Frame size	Motor voltage	Peak torque selection	Stator length	Winding speed	Brake	Connection type
	055-190 Frame	055 Frame	055 Frame	055 Frame	055 Frame	055 Frame
055	**E** = 220V	**2** = Standard peak torque	A	**30** = 3000 rpm	**0** = Not fitted	**B** = Power and Signal 90° rotatable
075	**U** = 400V	075-142 Frame	B	**60** = 6000 rpm	**1** = Parking brake fitted 24Vdc	
095	250 Frame	**2** = Standard peak torque	C	075-190 Frame		075-190 Frame
115	**U** = 400V	**P** = High peak torque	075 Frame	**20** = 2000 rpm	075-190 Frame	**V** = Power and Signal vertical
142		190-250 Frame	A	**30** = 3000 rpm	**0** = Not fitted (Std)	250 Frame
190		**2** = Standard peak torque	B	**40** = 4000 rpm	**1** = Parking brake fitted 24Vdc	**C** = Power 90° rotatable and Signal vertical
250			C	**60** = 6000 rpm		
			D	250 Frame	**5** = High energy dissipation parking brake 24V	***H** = Power hybrid box and Signal vertical (Std)
			095-142 Frame	**10** = 1000 rpm		
			A	**15** = 1500 rpm		
			B	**20** = 2000 rpm*	250 Frame	
			C	**25** = 2500 rpm*	**0** = Not fitted (Std)	
			D		**5** = High energy dissipation parking brake 24V	
			E			
			190 Frame			
			A			
			B			
			C			
			D			
			E			
			F			
			G			
			H			
			250 frame			
			D*			
			E*			
			F*			

* 250 D and E lengths, winding speed equal and above 2500rpm must use the Hybrid box.

* 250 F lengths, winding speed equal and above 2000rpm must use the Hybrid box.

Additional options - available upon request

Additional options are available upon request but may require a longer lead time to complete, please check with the Drive Centre/Distributor for details.

Frame size	Motor voltage	Peak torque selection	Stator length	Winding speed	Brake	Connection type
	055-250 Frame	055-250 Frame	055-250 Frame	055-250 Frame	055-250 Frame	055 Frame
055				**XX** = Special	**X** = Special	**C** = Power 90° rotatable and Signal vertical
075						**V** = Power and Signal vertical
095						**X** = Special
115						075-115 Frame
142						**A** = Power and Signal 90° fixed
190						**B** = Power and Signal 90° rotatable
250						**C** = Power 90° rotatable and Signal vertical
						X = Special
						142-190 Frame
						A = Power and Signal 90° fixed
						B = Power and Signal 90° rotatable
						C = Power 90° rotatable and Signal vertical
						H = Hybrid box
						X = Special
						250 Frame
						V = Power and Signal vertical

A	**CA**		**A**	**100**	**190**	
Output shaft	Feedback device		Inertia	PCD	Shaft diameter	
055-250 Frame	055 Frame		055 Frame	055 Frame		
A = Keyed	**AR** = Resolver		A = Standard	063	11.0	A-C
B = Plain shaft	**CP** = Incremental Encoder	4096 ppr	075-190 Frame	075 Frame		
	MP = Incremental Encoder (Std)	2048 ppr	A = Standard	075	11.0	A
	EM = Inductive Absolute Multi-turn	EQI 1130	B = High		14.0	B-D
	FM = Inductive Absolute Single turn	ECI 1118	250 Frame	095 Frame		
	TL = Optical SinCos Multi-turn	SKM 36	A = Standard	100	14.0	A
	UL = Optical SinCos Single turn	SKS 36			19.0	B-E
	075-142 Frame			115 Frame		
	AE = Resolver			115	19.0	A-C
	CA = Incremental Encoder (Std)	4096 ppr			24.0	D-E
	EB = Optical Absolute Multi-turn	EQN 1325		142 Frame		
	FB = Optical Absolute Single turn	ECN 1313		165	24.0	A-E
	EC = Inductive Absolute Multi-turn	EQI 1331		190 Frame		
	FC = Inductive AbsoluteSingle turn	ECI 1319		215	32.0	A-H
	LC = Inductive Absolute Multi-turn[1]	EQI 1331		250 Frame		
	NC = Inductive Absolute Single turn[1]	ECI 1319		300	48.0	D-F
	RA = Optical SinCos Multi-turn	SRM 50				
	SA = Optical SinCos Single turn	SRS 50				
	190-250 Frame					
	AE = Resolver					
	CA = Incremental Encoder	4096 ppr				
	EB = Optical Absolute Multi-turn	EQN 1325				
	FB = Optical Absolute Single turn	ECN 1313				
	RA = Optical SinCos Multi-turn	SRM 50				
	SA = Optical SinCos Single turn	SRS 50				

[1] Serial comms only

Output shaft	Feedback device		Inertia	PCD***		Shaft diameter	
075-250 Frame	075-250 Frame		055-250 Frame	055 Frame			
F = Key and Half key supplied separately	**MA** = Incremental Encoder[2]	2048 ppr	X = Special	070		9.0	
	GB = Optical Absolute Multi turn	EQN 1337				14.0	Max
	HB = Optical Absolute Single turn	ECN 1325				XXX =	Special
X = Special	**WB** = Optical Absolute Single turn	ECN 1313		075 Frame			
	XX = Special			080		19.0	Max
				085		XXX =	Special
				095 Frame			
				098		22.0	Max
				115		XXX =	Special
				115 Frame			
				130		24.0	Max
						XXX =	Special
				142 Frame			
				149		32.0	Max
						XXX =	Special
				190 Frame			
					N/A	42.0	Max
						XXX =	Special

Notes

[2] Not available on the 190 or 250 frame

Motors with X in the part number will require the additional ending -S*** as these are speical customer designed motors.

Motors with the ending -G*** are motors that have gearboxes supplied and assembled to the motor.

*** Optional PCD's will have a different register diameter from the standard motors.

1.3 Ratings

1.3.1 3 Phase VPWM drives 200-240Vrms

Δt= 100°C winding 40°C maximum ambient All data subject to +/-10% tolerance

Motor frame size (mm)	055E2			075E2				095E2				
Frame length	A	B	C	A	B	C	D	A	B	C	D	E
Continuous stall torque (Nm)	0.72	1.18	1.65	1.2	2.2	3.1	3.9	2.3	4.3	5.9	7.5	9.0
Standard (2) peak torque selection max (Nm)	2.88	4.72	6.60	3.6	6.6	9.3	11.7	6.9	12.9	17.7	22.5	27.0
High (P) peak torque selection max (Nm)	N/A	N/A	N/A	6	11	15.5	19.5	10.4	19.4	26.6	33.8	40.5
Standard inertia (kgcm²)	0.12	0.23	0.34	0.7	1.2	1.6	2.0	1.8	2.9	4.0	5.1	6.2
High inertia (kgcm²)				1.1	1.5	2.0	2.4	3.7	4.8	5.9	7.0	8.1
Winding thermal time const. (s)	34.0	38.0	42.0	81	74	94	100	172	168	183	221	228
Standard motor weight unbraked (kg)	1.20	1.50	1.80	3.60	4.40	5.20	6.00	5.10	6.30	7.50	8.70	9.90
Standard motor weight braked (kg)	1.60	1.90	2.20	4.10	4.90	5.70	6.50	5.70	6.90	8.70	9.30	10.50
Rated speed 2000 (rpm) Kt (Nm/A) = Ke (V/krpm) =				Kt (Nm/A) = 1.40 Ke (V/krpm) = 85.50								
Rated torque (Nm)	C/D	C/D	C/D	1.1	2.1	3.0	3.8	2.2	4.0	5.5	6.9	8.2
Stall current (A)				0.9	1.6	2.3	2.8	1.7	3.1	4.3	5.4	6.5
Rated power (kW)				0.23	0.44	0.63	0.80	0.46	0.84	1.15	1.45	1.72
R (ph-ph) (Ω)				45.80	15.30	8.52	5.72	20.69	6.24	3.16	2.31	1.71
L (ph-ph) (mH)				74.10	34.71	21.50	16.16	72.40	22.50	13.73	10.79	8.70
Rated speed 3000 (rpm) Kt (Nm/A) = Ke (V/krpm) =	0.74 45.00	0.87 52.50	0.91 55.00	Kt (Nm/A) = 0.93 Ke (V/krpm) = 57.00								
Rated torque (Nm)	0.70	1.05	1.48	1.1	2.0	2.8	3.5	2.0	3.9	5.4	6.8	8.1
Stall current (A)	0.97	1.36	1.81	1.3	2.4	3.4	4.2	2.5	4.7	6.4	8.1	9.7
Rated power (kW)	0.22	0.33	0.46	0.35	0.63	0.88	1.10	0.63	1.23	1.70	2.14	2.54
R (ph-ph) (Ω)	28.00	14.10	9.50	15.91	6.22	3.35	2.37	8.03	2.68	1.35	1.03	0.77
L (ph-ph) (mH)	50.00	32.00	23.00	30.33	14.74	9.54	7.08	22.04	8.70	6.10	4.48	3.99
Rated speed 4000 (rpm) Kt (Nm/A) = Ke (V/krpm) =				Kt (Nm/A) = 0.72 Ke (V/krpm) = 44.00								
Rated torque (Nm)	C/D	C/D	C/D	1.0	1.7	2.3	2.9	1.8	3.0	4.0	4.9	5.7
Stall current (A)				1.7	3.1	4.4	5.5	3.2	6.0	8.2	10.5	12.5
Rated power (kW)				0.42	0.71	0.96	1.21	0.75	1.26	1.68	2.05	2.39
R (ph-ph) (Ω)				12.10	4.05	2.30	1.48	5.15	1.64	0.92	0.62	0.42
L (ph-ph) (mH)				19.60	8.88	5.85	4.20	13.00	7.28	3.80	2.75	2.18
Rated speed 6000 (rpm) Kt (Nm/A) = Ke (V/krpm) =	0.45 27.00	0.43 26.00	0.48 29.00	Kt (Nm/A) = 0.47 Ke (V/krpm) = 28.50								
Rated torque (Nm)	0.68	0.90	1.20	0.9	1.6	2.1	2.6	1.3	2.1	2.8	C/D	C/D
Stall current (A)	1.61	2.74	3.44	2.6	4.7	6.6	8.3	4.9	9.2	12.6		
Rated power (kW)	0.43	0.57	0.75	0.57	1.01	1.32	1.63	0.82	1.32	1.76		
R (ph-ph) (Ω)	8.50	3.60	2.40	5.20	1.77	0.95	0.65	2.00	0.67	0.39		
L (ph-ph) (mH)	16.00	8.20	6.30	8.30	3.70	3.10	1.86	5.51	2.58	1.70		

C/D Consult Drive Centre/Distributor

N/A Not available

The information contained in this specification is for guidance only and does not form part of any contract

Stall torque, rated torque and power relate to maximum continuous operation tested in a 20°C ambient at 12kHz drive switching frequency

Control Techniques have an ongoing process of development and reserve the right to change the specification without notice

All other figures relate to a 20°C motor temperature. Maximum intermittent winding temperature is 140°C

	115E2					142E2					190E2							
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	F	G	H
	3.5	6.6	9.4	12.4	15.3	5.7	10.8	15.3	19.8	23.4	C/D	21.8	C/D	41.1	C/D	58.7	C/D	73.2
	10.5	19.8	28.2	37.2	45.9	17.1	32.4	45.9	59.4	70.2		65.4		123.0		176.0		219.0
	14	26.4	37.6	49.6	61.2	22.8	43.2	61.2	79.2	93.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	4.4	6.7	9.0	11.4	13.8	9.0	15.6	22.2	28.8	35.4		48.7		86.4		123.1		161.8
	9.5	11.8	14.1	16.6	18.9	23.3	29.9	36.5	43.1	49.7		93.9		131.6		168.3		207.0
	175	185	198	217	241	213	217	275	301	365		240		242		319		632
	7.80	9.70	11.60	13.50	15.40	10.50	13.30	16.10	18.90	21.70		25.30		33.90		42.50		51.30
	9.00	10.90	12.80	14.70	17.20	12.20	15.00	17.80	19.60	23.40		27.30		35.90		44.50		53.10
	3.2	6.1	8.7	10.8	14.0	5.3	10.3	14.6	18.4	21.3	C/D	20.0	C/D	36.9	C/D	50.4	C/D	C/D
	2.5	4.8	6.8	8.9	11.0	4.1	7.8	11.0	14.2	16.8		15.6		29.4		42.1		
	0.67	1.28	1.82	2.26	2.93	1.11	2.16	3.06	3.85	4.46		4.19		7.73		10.6		
	8.33	2.82	1.51	0.99	0.72	4.28	1.33	0.66	0.45	0.32		0.50		0.15		0.10		
	43.50	14.91	9.89	7.11	5.77	26.74	11.53	7.31	5.55	4.40		7.77		2.50		2.65		
	3.0	5.5	8.1	10.4	12.6	4.9	9.0	12.2	15.8	N/A	C/D	19.2	C/D	33.0	C/D	C/D	C/D	N/A
	3.8	7.1	10.2	13.4	16.5	6.2	11.7	16.5	21.3			23.5		44.2				
	0.94	1.73	2.54	3.27	3.96	1.54	2.83	3.83	4.96			6.03		10.4				
	3.70	1.30	0.73	0.47	0.37	1.90	0.26	0.23	0.22			0.17		0.06				
	15.94	7.23	4.82	3.37	3.49	11.87	4.05	2.49	3.32			2.62		1.26				
	2.5	4.7	6.3	7.5	C/D	3.6	7.0	C/D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	4.9	9.2	13.1	17.3		8.0	15.0											
	1.05	1.97	2.64	3.14		1.51	2.93											
	2.07	0.70	0.44	0.29		1.20	0.38											
	8.57	4.34	3.57	2.53		9.45	3.47											
	2.2	4.0	C/D	N/A	N/A	2.9	C/D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	7.5	14.1				12.2												
	1.38	2.51				1.82												
	0.96	0.30				0.49												
	3.43	2.09				3.96												

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1.3.2 3 Phase VPWM drives 380-480Vrms

Δt= 100°C winding 40°C maximum ambient All data subject to +/-10% tolerance

Motor frame size (mm)	055U2			075U2				095U2				
Frame length	A	B	C	A	B	C	D	A	B	C	D	E
Continuous stall torque (Nm)	0.72	1.18	1.65	1.2	2.2	3.1	3.9	2.3	4.3	5.9	7.5	9.0
Standard (2) peak torque selection max (Nm)	2.88	4.72	6.60	3.6	6.6	9.3	11.7	6.9	12.9	17.7	22.5	27.0
High (P) peak torque selection max (Nm)	N/A	N/A	N/A	6	11	15.5	19.5	10.4	19.4	26.6	33.8	40.5
Standard inertia (kgcm²)	0.12	0.23	0.34	0.7	1.2	1.6	2.0	1.8	2.9	4.0	5.1	6.2
High inertia (kgcm²)				1.1	1.5	2.0	2.4	3.7	4.8	5.9	7.0	8.1
Winding thermal time const. (s)	34.0	38.0	42.0	81	74	94	100	172	168	183	221	228
Standard motor weight unbraked (kg)	1.20	1.50	1.80	3.60	4.40	5.20	6.00	5.10	6.30	7.50	8.70	9.90
Standard motor weight braked (kg)	1.60	1.90	2.20	4.10	4.90	5.70	6.50	5.70	6.90	8.70	9.30	10.50
Rated speed 2000 (rpm) Kt (Nm/A) = Ke (V/krpm) =				Kt (Nm/A) = 2.40 Ke (V/krpm) = 147.00								
Rated torque (Nm)	C/D	C/D	C/D	1.1	2.1	3.0	3.8	2.2	4.0	5.5	6.9	8.2
Stall current (A)				0.5	1.0	1.3	1.7	1.0	1.8	2.5	3.2	3.8
Rated power (kW)				0.23	0.44	0.63	0.80	0.46	0.84	1.15	1.45	1.72
R (ph-ph) (Ω)				144.00	48.20	25.00	15.70	64.00	17.00	9.90	6.00	4.30
L (ph-ph) (mH)				214.00	99.20	59.20	44.70	202.00	54.50	36.50	25.60	18.90
Rated speed 3000 (rpm) Kt (Nm/A) = Ke (V/krpm) =	0.74 45.00	1.49 90.00	1.65 100.00	Kt (Nm/A) = 1.60 Ke (V/krpm) = 98.00								
Rated torque (Nm)	0.70	1.05	1.48	1.1	2.0	2.8	3.5	2.0	3.9	5.4	6.8	8.1
Stall current (A)	0.97	0.79	1.00	0.8	1.4	2.0	2.5	1.5	2.7	3.7	4.7	5.7
Rated power (kW)	0.22	0.33	0.46	0.35	0.63	0.88	1.10	0.63	1.23	1.70	2.14	2.54
R (ph-ph) (Ω)	28.00	45.00	31.00	60.80	20.10	10.50	7.50	24.50	6.80	4.00	2.74	2.00
L (ph-ph) (mH)	50.00	100.00	75.00	98.40	41.80	27.60	19.70	57.90	24.30	15.50	13.62	8.50
Rated speed 4000 (rpm) Kt (Nm/A) = Ke (V/krpm) =				Kt (Nm/A) = 1.20 Ke (V/krpm) = 73.50								
Rated torque (Nm)	C/D	C/D	C/D	1.0	1.7	2.3	2.9	1.8	3.0	4.0	4.9	5.7
Stall current (A)				1.0	1.9	2.6	3.3	2.0	3.6	5.0	6.3	7.5
Rated power (kW)				0.42	0.71	0.96	1.21	0.75	1.26	1.68	2.05	2.39
R (ph-ph) (Ω)				36.80	10.50	6.30	4.20	12.70	4.08	2.10	1.50	1.03
L (ph-ph) (mH)				54.90	24.80	14.90	10.80	31.50	13.60	8.50	6.30	4.80
Rated speed 6000 (rpm) Kt (Nm/A) = Ke (V/krpm) =	0.74 45.00	0.79 47.50	0.83 50.00	Kt (Nm/A) = 0.80 Ke (V/krpm) = 49.00								
Rated torque (Nm)	0.68	0.90	1.20	0.9	1.6	2.1	2.6	1.3	2.1	2.8	C/D	C/D
Stall current (A)	0.97	1.50	2.00	1.5	2.8	3.9	4.9	2.9	5.4	7.4		
Rated power (kW)	0.43	0.57	0.75	0.57	1.01	1.32	1.63	0.82	1.32	1.76		
R (ph-ph) (Ω)	28.00	10.70	7.80	15.00	5.00	2.66	1.90	5.45	1.82	1.05		
L (ph-ph) (mH)	50.00	25.00	20.00	24.00	10.60	6.80	4.80	14.10	6.00	3.80		

C/D Consult Drive Centre/Distributor

N/A Not available

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Stall torque, rated torque and power relate to maximum continuous operation tested in a 20°C ambient at 12kHz drive switching frequency

Control Techniques have an ongoing process of development and reserve the right to change the specification without notice

All other figures relate to a 20°C motor temperature. Maximum intermittent winding temperature is 140°C

	115U2					142U2					190U2							
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	F	G	H
	3.5	6.6	9.4	12.4	15.3	5.7	10.8	15.3	19.8	23.4	9.6	21.8	31.1	41.1	50.6	58.7	66.0	73.2
	10.5	19.8	28.2	37.2	45.9	17.1	32.4	45.9	59.4	70.2	28.8	65.4	93.3	123.0	151.6	176.0	198.0	219.0
	14	26.4	37.6	49.6	61.2	22.8	43.2	61.2	79.2	93.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	4.4	6.7	9.0	11.4	13.8	9.0	15.6	22.2	28.8	35.4	29.9	48.7	67.5	86.4	105.0	123.1	142.9	161.8
	9.5	11.8	14.1	16.6	18.9	23.3	29.9	36.5	43.1	49.7	75.1	93.9	112.7	131.6	150.2	168.3	188.1	207.0
	175	185	198	217	241	213	217	275	301	365	217	240	241	242	281	319	476	632
	7.80	9.70	11.60	13.50	15.40	10.50	13.30	16.10	18.90	21.70	21.00	25.30	29.60	33.90	38.20	42.50	46.80	51.30
	9.00	10.90	12.80	14.70	17.20	12.20	15.00	17.80	19.60	23.40	23.00	27.30	31.60	35.90	40.20	44.50	48.80	53.10
	3.2	6.1	8.7	10.8	14.0	5.3	10.3	14.6	18.4	21.3	9.3	20.0	28.4	36.9	43.8	50.4	53.0	54.7
	1.5	2.8	4.0	5.2	6.4	2.4	4.5	6.4	8.3	9.8	4.0	9.1	13.0	17.2	21.1	24.5	27.5	30.5
	0.67	1.28	1.82	2.26	2.93	1.11	2.16	3.06	3.85	4.46	1.95	4.19	5.90	7.73	9.20	10.6	11.1	11.5
	27.80	8.55	4.55	2.96	2.17	12.00	3.60	2.10	1.35	0.98	6.15	1.54	0.83	0.50	0.39	0.30	0.26	0.17
	108.00	40.50	25.70	21.90	17.36	83.00	35.90	18.70	13.60	10.70	52.90	23.55	15.00	8.81	8.68	7.16	6.89	4.63
	3.0	5.5	8.1	10.4	12.6	4.9	9.0	12.2	15.8	18.0	8.7	19.2	25.0	33.0	34.0	35.0	36.0	36.8
	2.2	4.2	5.9	7.8	9.6	3.6	6.8	9.6	12.4	14.7	6.0	13.7	19.4	25.7	31.6	36.7	41.3	45.8
	0.94	1.73	2.54	3.27	3.96	1.54	2.83	3.83	4.96	5.65	2.73	6.03	7.85	10.4	10.7	11.0	11.3	11.6
	12.60	3.86	2.02	1.40	1.08	5.30	2.06	0.97	0.61	0.42	2.73	0.70	0.41	0.22	0.17	0.11	0.15	0.09
	49.30	21.57	13.27	8.60	10.96	37.00	19.10	12.60	6.10	7.21	23.50	10.47	7.35	4.89	3.86	3.60	3.06	2.46
	2.5	4.7	6.3	7.5	8.7	3.6	7.0	8.9	10.7	12.2	7.0	17.5	21.5	29.0	N/A	N/A	N/A	N/A
	3.0	5.5	7.9	10.4	12.8	4.8	9.0	12.8	16.5	19.5	8.0	18.2	25.9	32.3				
	1.05	1.97	2.64	3.14	3.64	1.51	2.93	3.73	4.48	5.11	2.90	7.30	9.01	12.10				
	6.42	2.14	1.16	0.73	0.57	3.00	1.00	0.53	0.35	0.25	1.35	0.38	0.21	0.11				
	26.73	10.20	6.60	4.70	3.90	21.00	7.50	5.67	3.60	3.25	13.21	6.05	3.75	2.40				
	2.2	4.0	C/D	C/D	N/A	2.9	4.5	C/D	C/D	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	4.4	8.3				7.2	13.5											
	1.38	2.51				1.82	2.83											
	3.10	0.97				1.33	0.46											
	12.30	4.81				9.23	3.44											

EMERSON
Industrial Automation

3 Phase VPWM drives 380-480Vrms

Δt= 100°C winding 40°C maximum ambient All data subject to +/-10% tolerance

Motor frame size (mm)	250U2		
Frame length	D	E	F
Continuous stall torque (Nm)	92	116	136
Standard (2) peak torque selection max (Nm)	276.0	348.0	408.0
High (P) peak torque selection max (Nm)	N/A	N/A	N/A
Standard inertia (kgcm²)	275	337	400
High inertia (kgcm²)	408	502	597
Winding thermal time const. (s)	439	486	608
Standard motor weight unbraked (kg)	57.5	65.5	73.7
Standard motor weight braked (kg)	68.5	76.5	84.5
Speed 1000 (rpm) Kt (Nm/A) = Ke (V/krpm) =	Kt (Nm/A) = 5.4 Ke (V/krpm) = 323		
Rated speed (rpm)	1000	1000	1000
Rated torque (Nm)	75	92	106
Stall current (A)	17.2	21.7	25.4
Rated power (kW)	7.9	9.6	11.1
R (ph-ph) (Ω)	0.61	0.48	0.34
L (ph-ph) (mH)	22.9	19.1	14.9
Speed 1500 (rpm) Kt (Nm/A) = Ke (V/krpm) =	Kt (Nm/A) = 3.6 Ke (V/krpm) = 216		
Rated speed (rpm)	1500	1500	1500
Rated torque (Nm)	67	76	84
Stall current (A)	25.8	32.5	38.1
Rated power (kW)	10.5	11.9	13.2
R (ph-ph) (Ω)	0.27	0.21	0.15
L (ph-ph) (mH)	10	8.6	6.6
Speed 2000 (rpm) Kt (Nm/A) = Ke (V/krpm) =	Kt (Nm/A) = 2.7 Ke (V/krpm) = 162		
Rated speed (rpm)	1500	1500	1500
Rated torque (Nm)	65	73	81
Stall current (A)	34.4	43.4	50.9
Rated power (kW)	10.2	11.5	12.7
R (ph-ph) (Ω)	0.15	0.1	0.08
L (ph-ph) (mH)	5.7	4.2	3.7
Speed 2500 (rpm) Kt (Nm/A) = Ke (V/krpm) =	Kt (Nm/A) = 2.1 Ke (V/krpm) = 129		
Rated speed (rpm)	1500	1500	1500
Rated torque (Nm)	62	70	77
Stall current (A)	43.0	54.2	63.6
Rated power (kW)	9.7	11	12.1
R (ph-ph) (Ω)	0.09	0.08	0.06
L (ph-ph) (mH)	3.5	3.1	2.6

For the 250 motor frame size, resolver feedback is standard.

The Unimotor fm 250 servo motor has been designed to give greatest motor efficiency up to a rated, or rms, speed of 1500 rpm. The range does include the optional speeds of 2000rpm and 2500rpm. These windings will allow the end user to enter the intermittent speed zone as well as the intermittent torque zone on the 250 motor.

These higher speed windings are designed with optimum kt values that allow increased speed without demanding very high currents

The Unimotor fm 250 is designed for S2 to S6 duties and as such the rms values play an important part in the motor selection for torque and speed.

C/D Consult Drive Centre/Distributor

N/A Not available

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Stall torque, rated torque and power relate to maximum continuous operation tested in a 20°C ambient at 12kHz drive switching frequency

Control Techniques have an ongoing process of development and reserve the right to change the specification without notice

All other figures relate to a 20°C motor temperature. Maximum intermittent winding temperature is 140°C

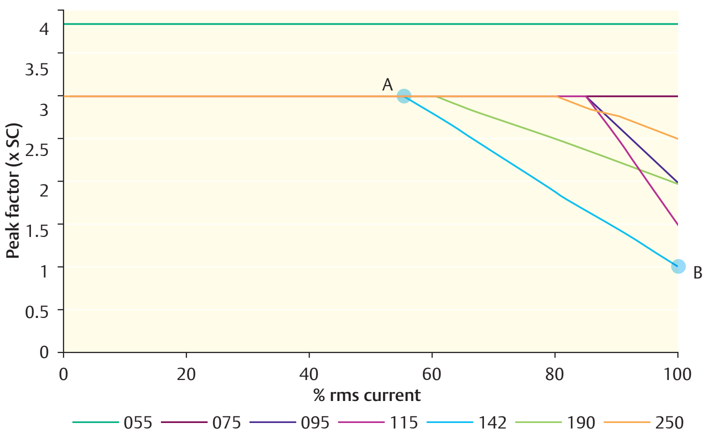
1.4 Peak torque information

Unimotor fm has two levels of peak torque available within the range, standard peak torque (code 2) and the high peak torque range (code P).

On some of the frame sizes the full peak torque can not be achieved at the full 100% rms current level. As shown below the 055 and 075 motors are not affected by the reduced levels and remains constant up to 100% rms current, whereas the 075-250 motors all show a drop at some point along the % rms current line.

The graph below shows the standard peak factor for each frame size.

Standard (2) peak torque



To use this graph correctly the rms current and rms speed of the application have to be calculated. The rms current value must then be converted into a percentage of the full motor current available, at that rms speed value. If the full current available is 10Amps and the rms current is 7.5Amps, then the percentage rms current value is 75%. This value can then be plotted onto the graph in order to obtain the peak factor. The peak factor is then used as part of the calculation, shown below, for the peak torque value.

Peak factor	x	Stall current	x	kt	=	Peak torque

An example would be with a 142U2E300 motor where the % rms current value is calculated to 50%, the peak factor would be 3. (Point A)

Peak factor	x	Stall current	x	kt	=	Peak torque
3.00	x	14.7	x	1.6	=	70.2Nm

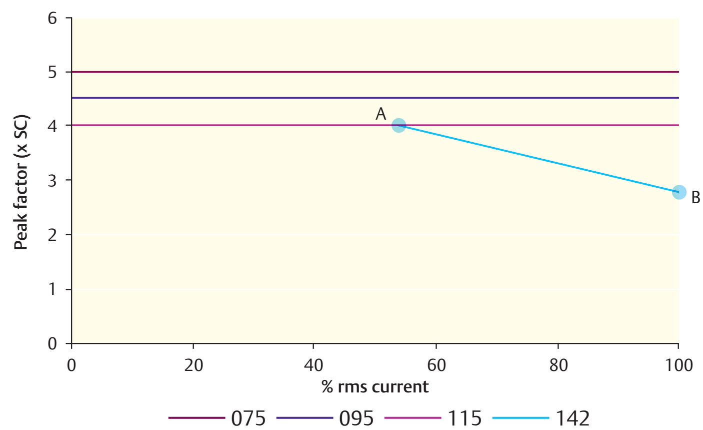
But if the % rms current value were to be calculated at a level of 100%, the peak factor would equal 1.00. (Point B)

Peak factor	x	Stall current	x	kt	=	Peak torque
1.00	x	14.7	x	1.6	=	23.4Nm

Peak torque is defined for a maximum period of 250ms, rms 3000rpm Δmax = 100°C, 40°C ambient.

Unimotor fm	Peak factor 0% to 100% rms	
055	3.8	
075	3.0	
095	Peak factor 0% to 88% rms	Peak factor @ 100% rms
	3.0	2.0
115	Peak factor 0% to 86% rms	Peak factor @ 100% rms
	3.0	1.5
142	Peak factor 0% to 57% rms	Peak factor @ 100% rms
	3.0	1.0
190	Peak factor 0 % to 60% rms	Peak factor @ 100% rms
	3.0	2.0
250	Peak factor 0% to 80% rms	Peak factor @ 100% rms
	3.0	2.5

High (P) peak torque



As shown above the 075 increases to 5 times, 095 increases to 4.5 times, the 115 increases to 4 times across the % rms current line and the 142 shows an increase to 4 times up until 57% dropping to 2.5 times at 100%.

Unimotor fm	Peak factor 0% to 100% rms	
075	5.0	
095	4.5	
115	4.0	
142	Peak factor 0% to 57% rms	Peak factor @ 100% rms
	4	2.5

Peak factor	x	Stall current	x	kt	=	Peak torque

An example would be with a 142U2E300 motor where the % rms current value is calculated to 50%, the peak factor would now be 4. (Point A)

Peak factor	x	Stall current	x	kt	=	Peak torque
4.00	x	14.7	x	1.6	=	93.6Nm

But if the % rms current value were to be calculated at a level of 100%, the peak factor would equal 2.5. (Point B)

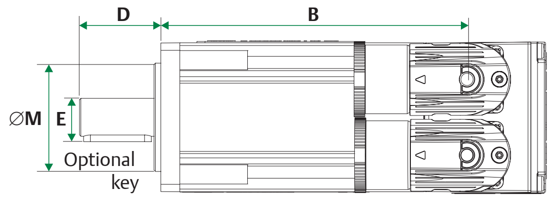
Peak factor x Stall current x kt = Peak torque

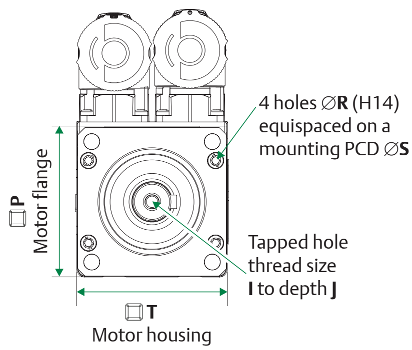
Peak factor	x	Stall current	x	kt	=	Peak torque
2.50	x	14.7	x	1.6	=	58.8Nm

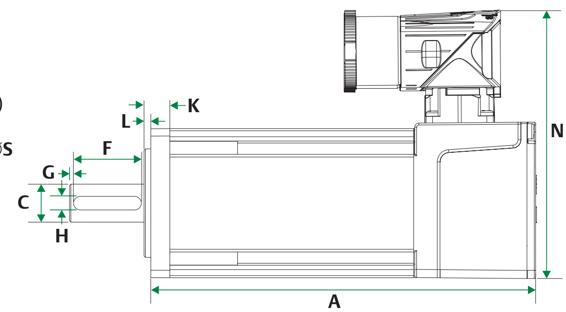
1.5 Dimensions

1.5.1 Frame size 055

NOTE: Output key dimensions (**E**,**F**,**G** and **H**) are applicable to keyed units only.







For vertical connectors, allow approximately 175.0mm clearance for mating cable

Standard motor dimension (mm) Note all dimensions shown are at nominal

	Unbraked length		Braked length		Flange thickness	Register length	Register diameter	Overall height	Flange square	Fixing hole diameter	Fixing hold PCD	Motor housing	Mounting bolts
	A	B	A	B	K	L	M (j6)	N	P	R (H14)	S	T	
055A	118.0	90.0	158.0	130.0									
055B	142.0	114.0	182.0	154.0	7.0	2.5	40.0	99.0	55.0	5.8	63.0	55.0	M5
055C	166.0	138.0	206.0	178.0									

Vertical connectors dimension (mm)

Note all dimensions shown are at nominal

	Unbraked length		Braked length		Power connector	Signal connector
	B1	B2	B1	B2	N	N
055A	75.0	83.0	115.0	123.0	104.0	93.0
055B	99.0	107.0	139.0	147.0	104.0	93.0
055C	123.0	131.0	163.0	173.0	104.0	93.0

Optional connector height (mm)

C type	96.00
V type	105.0

Output shaft dimensions (mm)

	Shaft diameter	Shaft length	Key height	Key length	Key to shaft end	Key width	Tapped hole thread size	Tapped hole depth
	C (j6)	D	E	F	G	H (h9)	I	J
9.0 Opt	9.0	20.0	10.2	15.0	1.0	3.0	M4	10.0
11.0 A-C Std	11.0	23.0	12.5	15.0	1.5	4.0	M4	10.0
14.0 Max	14.0	30.0	16.0	25.0	1.5	5.0	M5	12.5

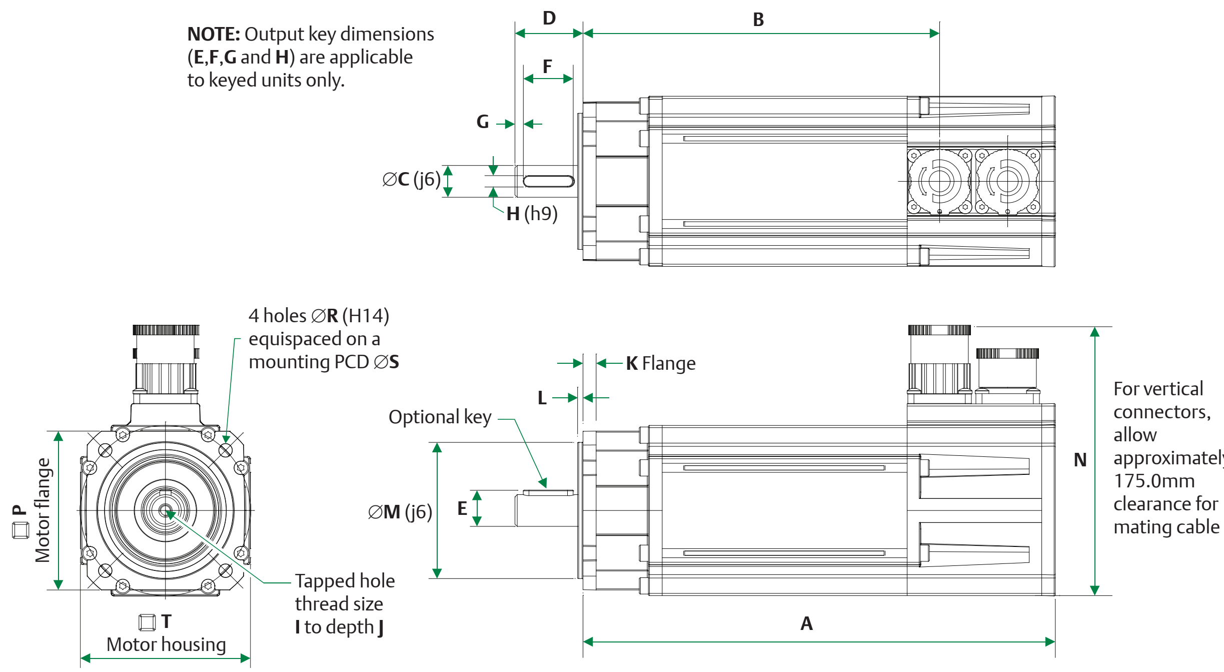
NOTE: Shaft options below the standard (Std) dimensions will require customer approval and may not be covered by warranty.

Optional flange dimensions (mm)

PCD code	Front end frame type	Flange thickness	Register length	Fixing hole diameter	Flange square	Fixing hole diameter	Fixing hold PCD	Mounting bolts
		K	L	M (j6)	P	R (H14)	S	
070	Flat	6	3	50	60	5.5	70	M5

NOTE: 3D drawings of the Unimotor fm and Unimotor hd motors can be downloaded from: http://motors.controltechniques.com/

1.5.2 Frame size 075



Standard motor dimension (mm) Note all dimensions shown are at nominal

	Unbraked length		Braked length		Flange thickness	Register length	Register diameter	Overall height	Flange square	Fixing hole diameter	Fixing hole PCD	Motor housing	Mounting bolts
	A (± 0.9)	B (± 1.0)	A (± 0.9)	B (± 1.0)	K (± 0.5)	L (± 0.1)	M (j6)	N (± 1.0)	P (± 0.1)	R (H14)	S (± 0.4)	T (± 0.45)	
075A	208.2	157.2	253.2	202.2	5.8	2.40	60.0	118.5	70.0	5.8	75.0	75.0	M5
075B	238.2	187.2	283.2	232.2									
075C	268.2	217.2	313.2	262.2									
075D	298.2	247.2	343.2	292.2									

Optional flat flange motor dimensions (mm)

	Unbraked length		Braked length	
	A (± 0.9)	B (± 1.0)	A (± 0.9)	B (± 1.0)
075A	192.6	141.6	237.6	186.6
075B	222.6	171.6	267.6	216.6
075C	252.6	201.6	297.6	246.6
075D	282.6	231.6	327.6	276.6

Optional connector height (mm)

Connection type	Overall height
	N (± 1.0)
A	118.5
B	126.0
C	126.0

Optional flange dimensions (mm)

PCD code	Front end frame type	Flange square	Fixing hole PCD	Register diameter	Fixing hole diameter
		P (± 0.1)	S (± 0.4)	M (j6)	R (H14)
075	Extended	70.0	66.7 - 75.0	60.0	5.80
080	Extended	70.0	75.0 - 80.0	60.0	5.80
085	Flat	80.0	85.0	70.0	7.00

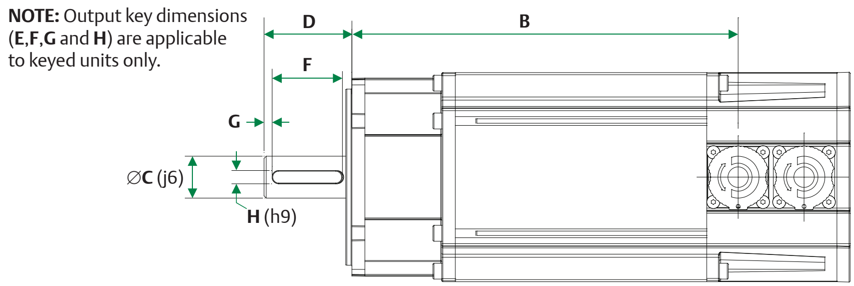
Output shaft dimensions (mm)

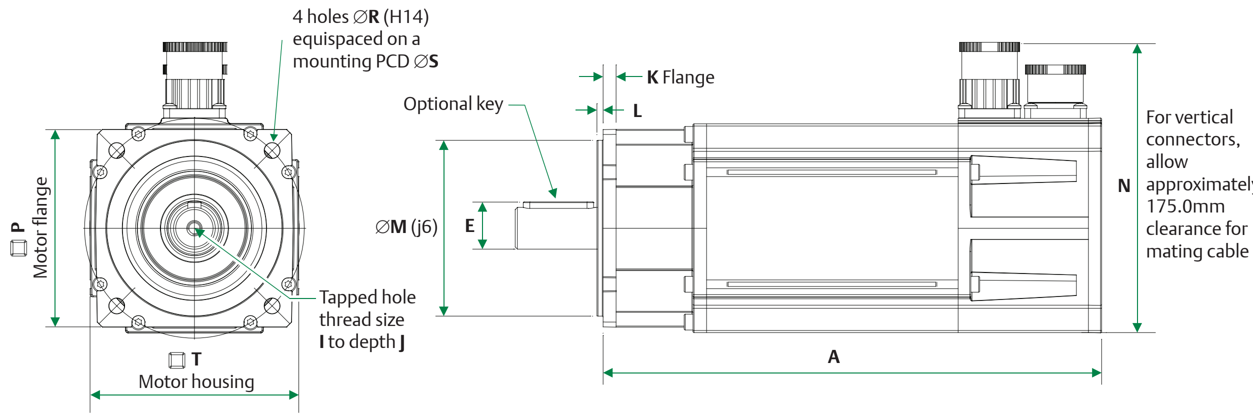
	Shaft diameter	Shaft length	Key height	Key length	Key to shaft end	Key width	Tapped hole thread size	Tapped hole depth
	C (j6)	D (± 0.45)	E (To IEC 72-1)	F (± 0.25)	G (± 1.1)	H (h9)	I	J (± 1.0)
11.0 A Std	11.0	23.0	12.5	14.0	3.6	4.0	M4 x 0.4	11.0
14.0 B-D Std	14.0	30.0	16.0	22.0	3.6	5.0	M5 x 0.8	13.5
19.0 Max	19.0	40.0	21.5	32.0	3.6	6.0	M6 x 1.0	17.0

NOTE: Shaft options below the standard (Std) dimensions will require customer approval and may not be covered by warranty.

NOTE: 3D drawings of the Unimotor fm and Unimotor hd motors can be downloaded from: http://motors.controltechniques.com/

1.5.3 Frame size 095





Standard motor dimension (mm) Note all dimensions shown are at nominal

	Unbraked length		Braked length		Flange thickness	Register length	Register diameter	Overall height	Flange square	Fixing hole diameter	Fixing hole PCD	Motor housing	Mounting bolts
	A (± 0.9)	B (± 1.0)	A (± 0.9)	B (± 1.0)	K (± 0.5)	L (± 0.1)	M (j6)	N (± 1.0)	P (± 0.1)	R (H14)	S (± 0.4)	T (± 0.6)	
095A	226.9	175.9	271.9	220.9									
095B	256.9	205.9	301.9	250.9									
095C	286.9	235.9	331.9	280.9	5.9	2.80	80.0	131.5	90.0	7.0	100.0	95.0	M6
095D	316.9	265.9	361.9	310.9									
095E	346.9	295.9	391.9	340.9									

Optional flat flange motor dimensions (mm)

	Unbraked length		Braked length	
	A (± 0.9)	B (± 1.0)	A (± 0.9)	B (± 1.0)
095A	201.8	150.8	246.8	195.8
095B	231.8	180.8	276.8	225.8
095C	261.8	210.8	306.8	255.8
095D	291.8	240.8	336.8	285.8
095E	321.8	270.8	366.8	315.8

Optional connector height (mm)

Connection type	Overall height
	N (± 1.0)
A	131.5
B	139.0
C	139.0

Optional flange dimensions (mm)

PCD code	Front end frame type	Flange square	Fixing hole PCD	Register diameter	Flange thickness	Fixing hole diameter
		P (± 0.1)	S (± 0.4)	M (j6)	K (± 0.5)	R (H14)
098	Extended	90.0	98.43	73.0	6.8	7.0
115	Flat	105.0	115.0	95.0	6.8	10.0

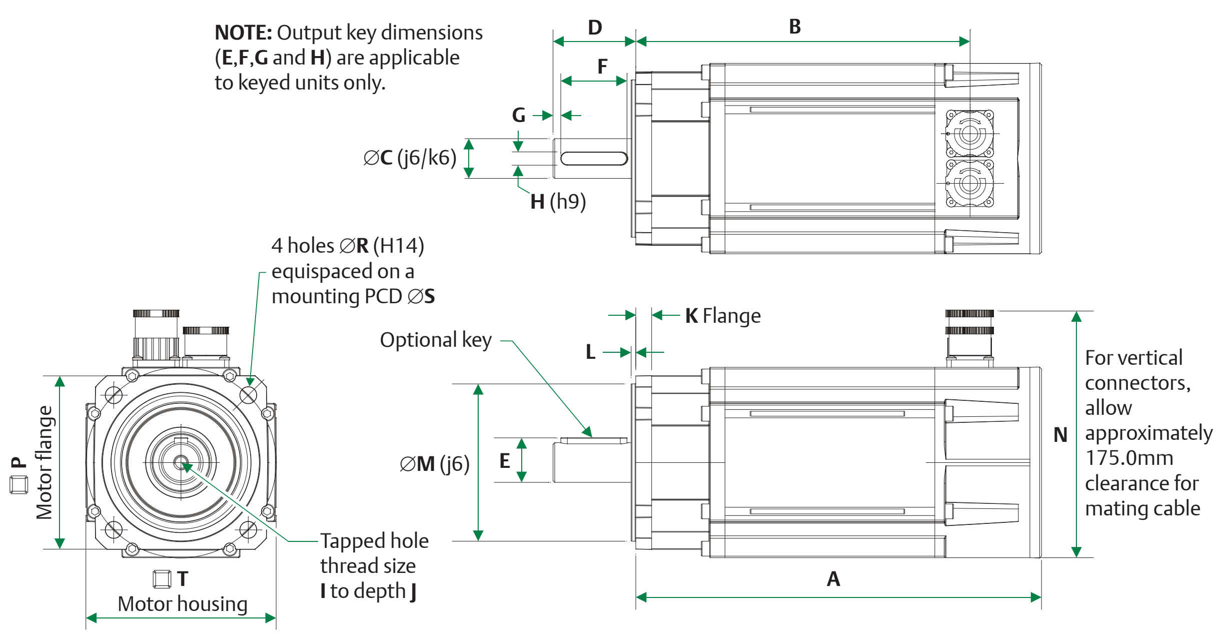
Output shaft dimensions (mm)

	Shaft diameter	Shaft length	Key height	Key length	Key to shaft end	Key width	Tapped hole thread size	Tapped hole depth
	C (j6)	D (± 0.45)	E (To IEC 72-1)	F (± 0.25)	G (± 1.1)	H (h9)	I	J (± 1.0)
14.0 A Std	14.0	30.0	16.0	22.0	3.6	5.0	M5 x 0.8	13.5
19.0 B-E Std	19.0	40.0	21.5	32.0	3.6	6.0	M6 x 1.0	17.0
22.0 Max	22.0	50.0	24.5	40.0	4.6	6.0	M8 x 1.25	20.0

NOTE: Shaft options below the standard (Std) dimensions will require customer approval and may not be covered by warranty.

NOTE: 3D drawings of the Unimotor fm and Unimotor hd motors can be downloaded from: http://motors.controltechniques.com/

Frame size 115



Standard motor dimension (mm) Note all dimensions shown are at nominal

	Unbraked length		Braked length		Flange thickness	Register length	Register diameter	Overall height	Flange square	Fixing hole diameter	Fixing hole PCD	Motor housing	Mounting bolts
	A (± 0.9)	B (± 1.0)	A (± 0.9)	B (± 1.0)	K (± 0.5)	L (± 0.1)	M (j6)	N (± 1.0)	P (± 0.2)	R (H14)	S (± 0.4)	T (± 0.6)	
115A	245.2	202.	290.2	247.0									
115B	275.2	232.0	320.2	277.0									
115C	305.2	262.0	350.2	307.0	9.6	2.80	95.0	149.0	105.0	10.0	115.0	115.0	M8
115D	335.2	292.0	380.2	337.0									
115E	365.2	322.0	410.2	367.0									

Optional flat flange motor dimensions (mm)

	Unbraked length		Braked length	
	A (± 0.9)	B (± 1.0)	A (± 0.9)	B (± 1.0)
115A	214.4	171.2	259.4	216.2
115B	244.4	201.2	289.4	246.2
115C	274.4	231.2	319.4	276.2
115D	304.4	261.2	349.4	306.2
115E	334.4	291.2	379.4	336.2

Optional connector height (mm)

Connection type	Overall height
	N (± 1.0)
A	149.0
B	156.5
C	156.5

Optional flange dimensions (mm)

PCD code	Front end frame type	Flange square	Fixing hole PCD	Register diameter	Fixing hole diameter
		P (± 0.2)	S (± 0.4)	M (j6)	R (H14)
130	Flat	130.0	130.0	110.0	10.0

Output shaft dimensions(mm)

	Shaft diameter	Shaft length	Key height	Key length	Key to shaft end	Key width	Tapped hole thread size	Tapped hole depth
	C (j6)	D (± 0.45)	E (To IEC 72-1)	F (± 0.25)	G (± 1.1)	H (h9)	I	J (± 0.4)
19.0 A-C Std	19.0	40.0	21.5	32.0	3.6	6.0	M6 x 1.0	17.0
22.0 Opt	22.0	50.0	24.5	40.0	4.6	6.0	M8 x 1.25	20.0
24.0 D-E Std	24.0	50.0	27.0	40.0	4.6	8.0	M8 x 1.25	20.0
28.0 Opt	28.0	60.0	31.0	50.0	4.6	8.0	M10 x 1.5	23.0
32.0 Max	32.0 (K6)	80.0	35.0	70.0	4.6	10.0	M12 x 1.75	29.0

NOTE: Shaft options below the standard (Std) dimensions will require customer approval and may not be covered by warranty.

NOTE: 3D drawings of the Unimotor fm and Unimotor hd motors can be downloaded from: http://motors.controltechniques.com/

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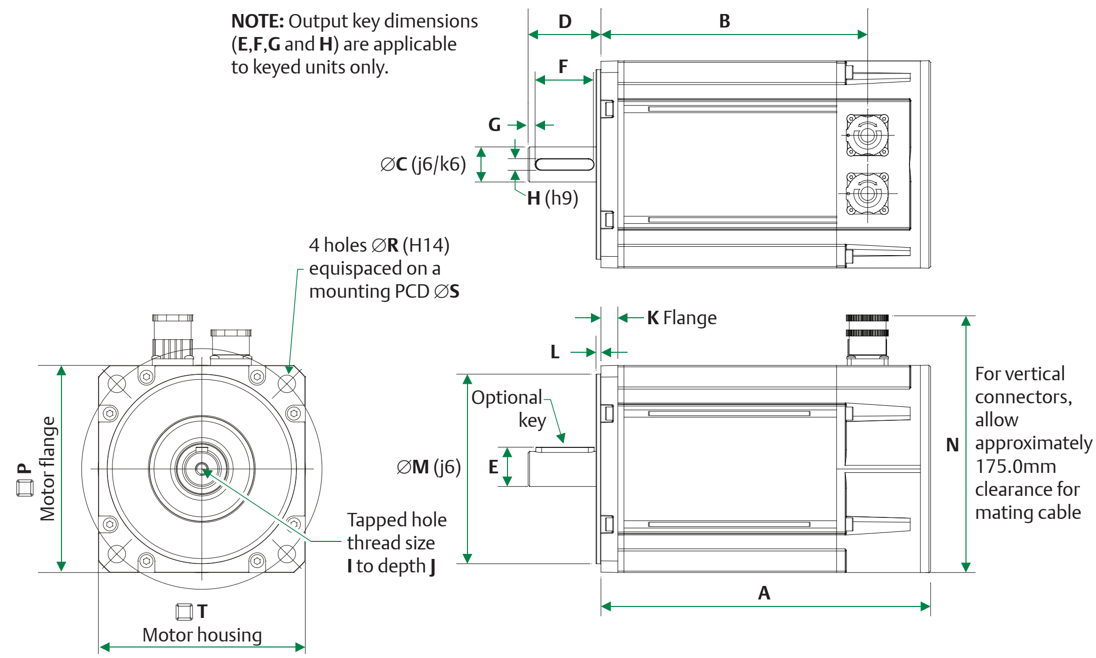
1.5.5 Frame size 142



Standard motor dimension (mm) Note all dimensions shown are at nominal

	Unbraked length		Braked length		Flange thickness	Register length	Register diameter	Overall height vertical	Flange square	Fixing hole diameter	Fixing hole PCD	Motor housing	Mounting bolts
	A (± 0.9)	B (± 1.0)	A (± 0.9)	B (± 1.0)	K (± 0.5)	L (± 0.1)	M (j6)	N (± 1.0)	P (± 0.2)	R (H14)	S (± 0.4)	T (± 0.7)	
142A	226.2	183.0	271.2	228.0	11.6	3.4	130.0	176.0	142.0	12.0	165.0	142.0	M10
142B	256.2	213.0	301.2	258.0									
142C	286.2	243.0	331.2	288.0									
142D	316.2	273.0	361.2	318.0									
142E	346.2	303.0	391.2	348.0									

Optional motor flange dimensions (mm)

	Unbraked length		Braked length	
	A(± 0.9)	B (± 1.0)	A (± 0.9)	B (± 1.0)
142A	273.4	230.2	318.4	275.2
142B	303.4	260.2	348.4	305.2
142C	333.4	290.2	378.4	335.2
142D	363.4	320.2	408.4	365.2
142E	393.4	350.2	438.4	395.2

Optional connector height (mm)

Connection type	Overall height
	N (± 1.0)
A	176.0
B	183.5
C	183.5

Optional flange dimensions (mm)

PCD code	Front end frame type	Flange square	Fixing hole PCD	Register diameter	Flange thickness	Fixing hole diameter
		P (± 0.2)	S (± 0.1)	M (j6)	K (± 0.5)	R (H14)
149	Extended	140.0	149.23	114.3	11.5	12.0

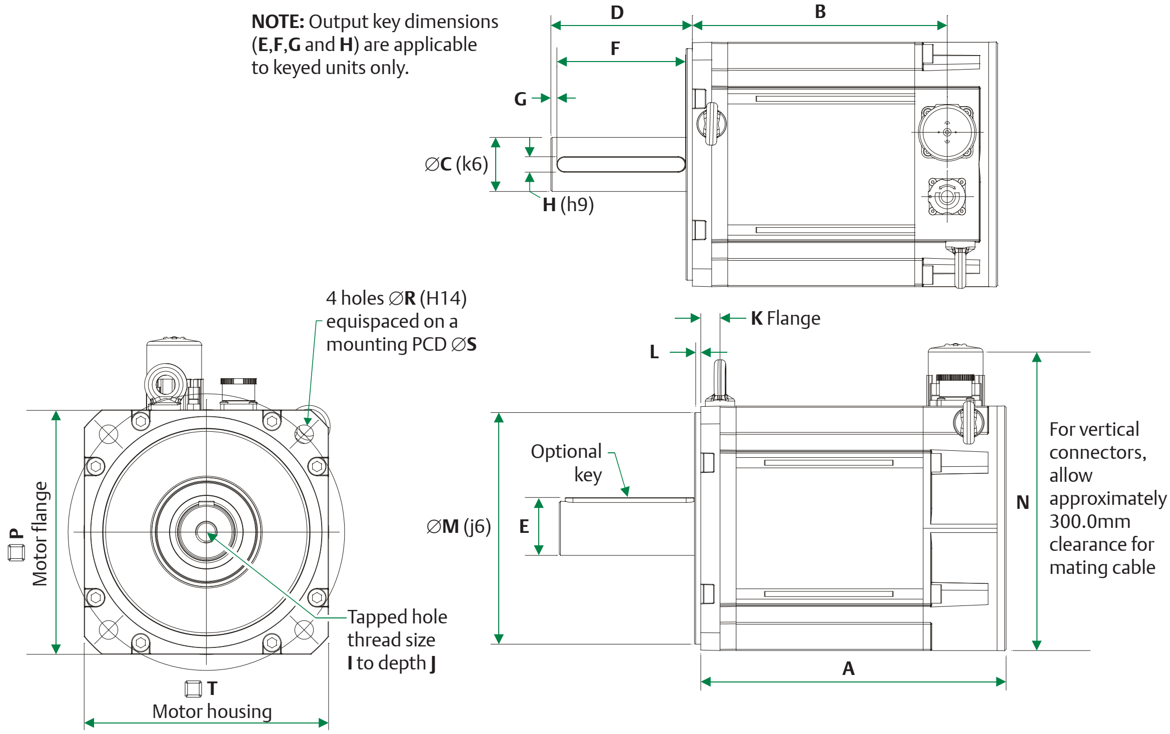
Output shaft dimensions (mm)

	Shaft diameter	Shaft length	Key height	Key length	Key to shaft end	Key width	Tapped hole thread size	Tapped hole depth
	C (j6)	D (± 0.45)	E (To IEC 72-1)	F (± 0.25)	G (± 1.1)	H (h9)	I	J (± 1.0)
22.0 Opt	22.0	50.0	24.5	40.0	4.6	6.0	M8 x 1.25	20.0
24.0 A-E Std	24.0	50.0	27.0	40.0	4.6	8.0	M8 x 1.25	20.0
28.0 Opt	28.0	60.0	31.0	50.0	4.6	8.0	M10 x 1.5	23.0
32.0 Max	32.0 (K6)	80.0	35.0	70.0	4.6	10.0	M12 x 1.75	29.0

NOTE: Shaft options below the standard (Std) dimensions will require customer approval and may not be covered by warranty.

NOTE: 3D drawings of the Unimotor fm and Unimotor hd motors can be downloaded from: http://motors.controltechniques.com/

1.5.6 Frame size 190



Standard motor dimension (mm) Note all dimensions shown are at nominal

	Unbraked length		Braked length		Flange thickness	Register length	Register diameter	Overall height	Flange square	Fixing hole diameter	Fixing hole PCD	Motor housing	Mounting bolts
	A (± 0.9)	B (± 1.0)	A (± 0.9)	B (± 1.0)	K (± 0.5)	L (± 0.1)	M (j6)	N (± 1.0)	P (± 0.2)	R (H14)	S (± 0.4)	T (± 1.5)	
190A	237.4	198.2	318.2	279.0	15.0	3.90	180.0	232.0	190.0	14.5	215.0	190.0	M12
190B	264.3	225.1	345.2	306.0									
190C	291.3	252.1	372.1	332.9									
190D	318.2	279.0	399.1	359.9									
190E	345.2	306.0	426.0	386.8									
190F	372.1	332.9	453.0	413.8									
190G	399.1	359.9	479.9	440.7									
190H	426.0	386.8	506.9	467.7									

Optional connector height (mm)

Connection type	Overall height
	N (± 1.0)
A	245.0
B	252.5
C	252.5

Output shaft dimensions (mm)

	Shaft diameter	Shaft length	Key height	Key length	Key to shaft end	Key width	Tapped hole thread size	Tapped hole depth
	C (j6)	D (± 0.45)	E (To IEC 72-1)	F (± 0.25)	G (± 1.1)	H (h9)	I	J (± 1.0)
28.0 Opt	28.0	60.0	31.0	50.0	4.6	8.0	M10 x 1.5	23.0
32.0 A-H Std	32.0 (k6)	80.0	35.0	70.0	4.6	10.0	M12 x 1.75	29.0
38.0 Opt	38.0 (k6)	80.0	41.0	70.0	4.6	10.0	M12 x 1.75	29.0
42.0 Max	42.0 (k6)	110.0	45.0	100.0	4.6	12.0	M16 x 2.0	37.0

NOTE: Shaft options below the standard (Std) dimensions will require customer approval and may not be covered by warranty.

NOTE: 3D drawings of the Unimotor fm and Unimotor hd motors can be downloaded from: http://motors.controltechniques.com/

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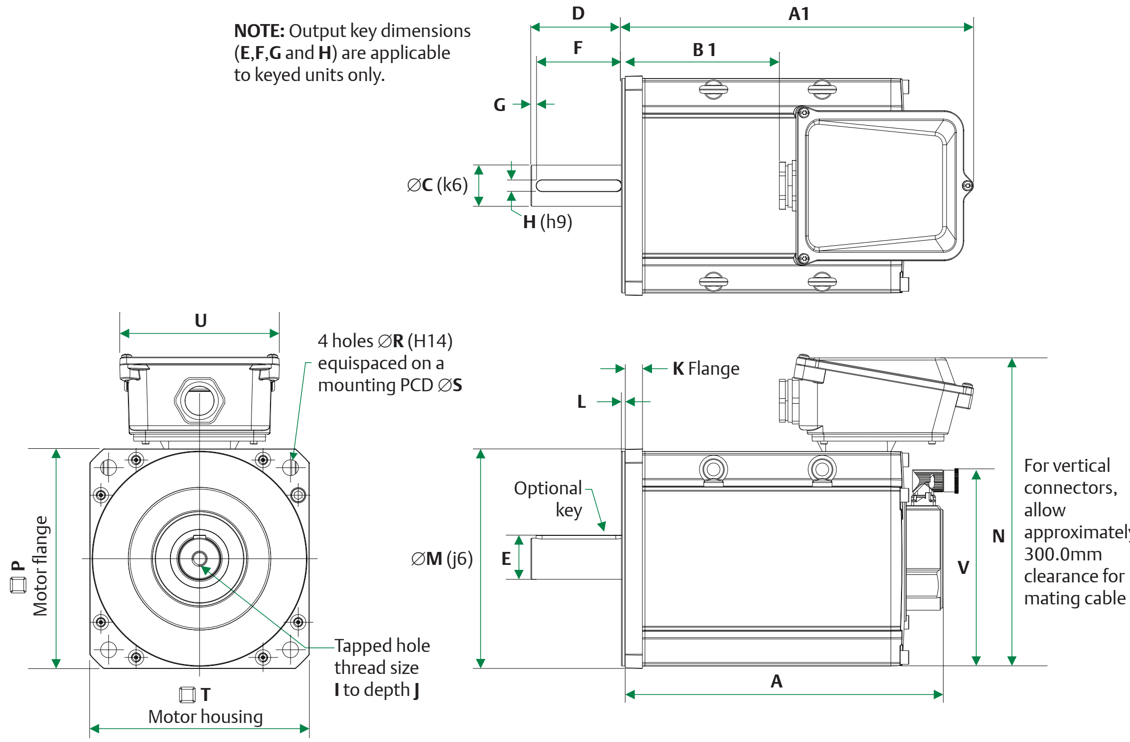
1.5.7 Frame size 250



Standard motor dimension (mm) Note all dimensions shown are at nominal

	Motor Length			Flange thickness	Register length	Register diameter	Overall height	Flange square	Fixing hole diameter	Fixing hole PCD	Motor housing	Hybrid box width	Signal connector height	Mounting bolts
	A (± 1.3)	A1 (± 2.0)	B1 (± 1.3)	K (± 0.5)	L (± 0.1)	M (j6)	N (± 1.0)	P (± 0.6)	R (H14)	S (± 0.4)	T (± 1.0)	U (± 0.4)	V (± 1.0)	
	Unbraked motor													
250D	370.7	406.1	179.7	20.0	4.50	250.0	362.8	256.0	18.5	300.0	249.5	186.0	228.5	M16
250E	400.7	436.1	209.7											
250F	430.7	466.1	239.7											
	Braked motor													
250D	442.5	477.9	251.5											
250E	472.5	507.9	281.5											
250F	502.5	537.9	311.5											

Output shaft dimensions (mm)

	Shaft diameter	Shaft length	Key height	Key length	Key to shaft end	Key width	Tapped hole thread size	Tapped hole depth
	C (k6)	D (± 0.45)	E (To IEC 72-1)	F (± 0.25)	G (± 1.1)	H (h9)	I	J (± 1.0)
38.0 Opt	38.0	80.0	41.0	70.0	4.6	10.0	M12 x 1.75	29.0
42.0 Opt	42.0	110.0	45.0	100.0	6.0	12.0	M16 x 2.0	37.0
48.0 D-F Std	48.0	110.0	51.5	100.0	6.0	14.0	M16 x 2.0	37.0

Optional connector height (mm)

Connection type	Power overall height	Signal overall height
	N (± 1.0)	V (± 1.0)
V	291.5	221.0
C	312.5	221.0

NOTE: Shaft options below the standard (Std) dimensions will require customer approval and may not be covered by warranty.

NOTE: 3D drawings of the Unimotor fm and Unimotor hd motors can be downloaded from: http://motors.controltechniques.com/

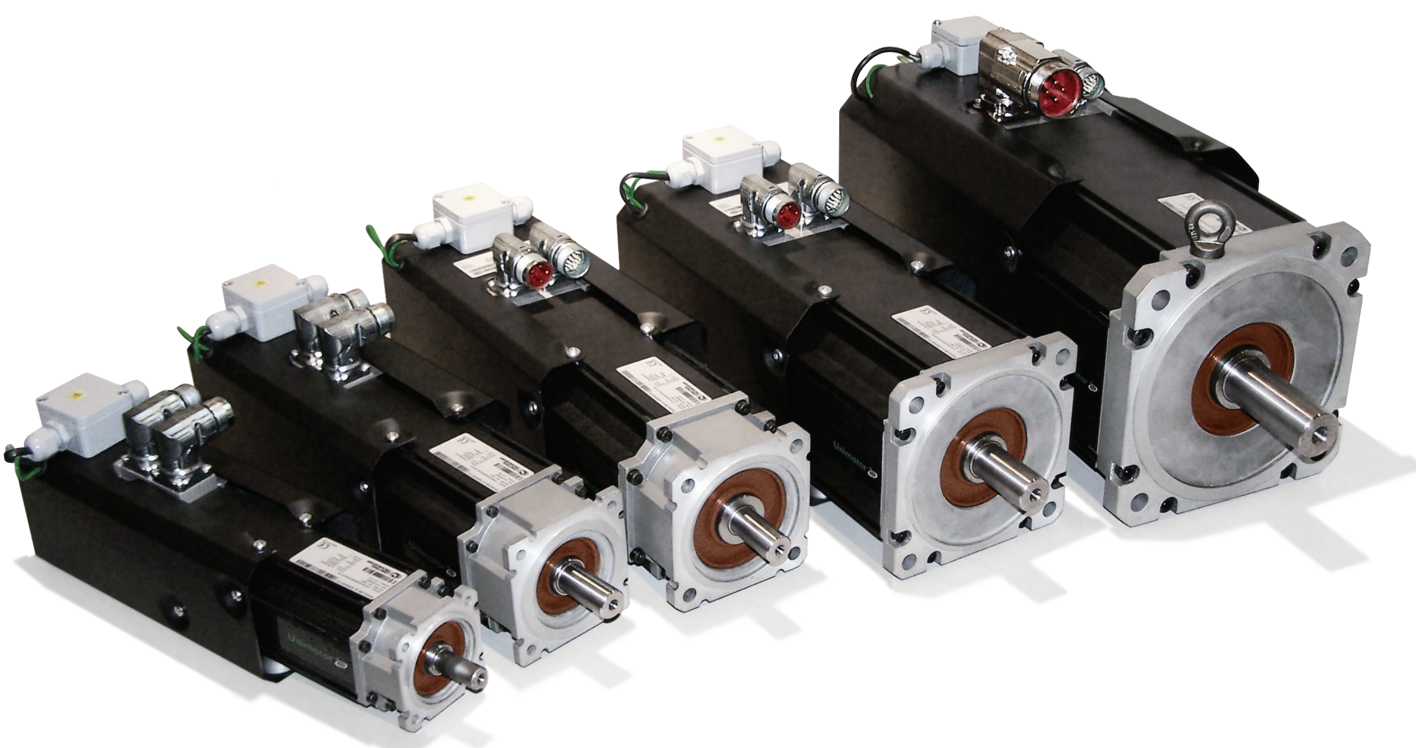
2 Introduction to Unimotor fm fan blown motors

2.1 Overview

Based on Unimotor fm mechanics with modified electro-magnetic construction, the fan blown version has been designed to give greater performance across the torque range. For example, the 190 fan blown variant increases the stall torque from 50.6Nm to 68Nm when compared to the standard Unimotor fm motor. This extra torque allows for increased application performance with higher rms values achievable.

The motors available have been selected to give the best torque increases across the available frame sizes.

To allow for the higher currents required, the 142 fan blown range is only available with the size 1.5 (53A rated) power connector.



2.2 Quick reference table

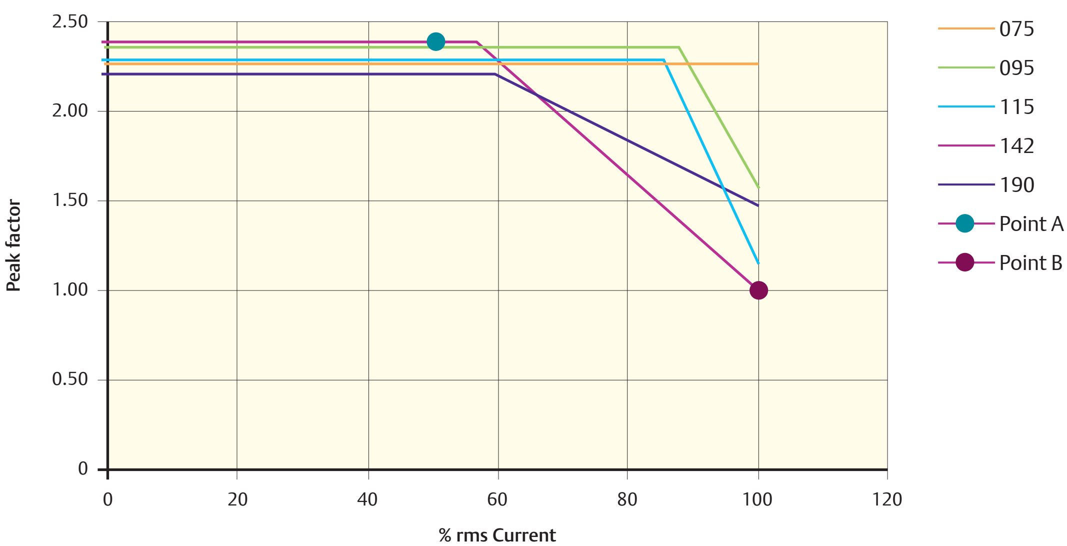
Frame size	PCD (mm)	Unimotor U4								Page No.
075	75		5.2							26
095	100			9.0						27
115	115					15.2 20.01				28
142	165					18.9	29.5			29
190	215							41.0	79.0	30
Stall	0	5	8	10	15	20	30	50	80	(Nm)

2.3 Peak torque information

With the Unimotor fm fan blown range, the stall and rated torque increase while there is no increase in the peak torque value. This means that the peak factors for fan blown motors are different to standard self cooled motors and these new values are shown in the table right.

Unimotor fm	Peak factor @ 0 -100% rms	
075	2.25	
095	Peak factor @ 0 to 88% rms	Peak factor @ 100% rms
	2.35	1.57
115	Peak factor @ 0 to 86% rms	Peak factor @ 100% rms
	2.28	1.14
142	Peak factor @ 0 - 57% rms	Peak factor @ 100% rms
	2.38	1.00
190	Peak factor @ 0 - 60% rms	Peak factor @ 100% rms
	2.20	1.47

Unimotor fm fan blown motor peak torque graph



Peak torque is defined for a maximum period of 250ms, rms 3000rpm, Δmax = 100˚C, 40˚C ambient

To use this graph correctly the rms current and rms speed of the application have to be calculated. The rms current value must then be converted into a percentage of the full motor current available, at the rms speed value. If the full current available is 10A and the rms current is 7.5A, then the percentage rms current value is 75%. This value can then be plotted onto the graph in order to obtain the peak factor. The peak factor is then used as part of the calculation, shown below, for the peak torque value.

Peak factor	x	Stall current	x	kt	=	Peak torque

An example would be with a 142U4E300 motor, where the % rms current value is calculated to 50%, the peak factor would be 2.38. (Point A)

Peak factor	x	Stall current	x	kt	=	Peak torque
2.38	x	18.4	x	1.6	=	70.2Nm

But if the % rms current value were to be calculated at a level of 100%, the peak factor would equal 1.00. (Point B)

Peak factor	x	Stall current	x	kt	=	Peak torque
1.00	x	18.4	x	1.6	=	29.5Nm

2.4 IP Ratings

Motor

IP65S - No ingress of dust; no contact with or approach to live or moving parts inside the enclosure. Water projected by a nozzle against enclosure from any direction shall have no harmful effects. (Excluding the front shaft seal.)

(S = device standing still during water test)

Fan motor and circuit board

IP54 - The fan motor and circuit board are coated to protect them against splash water and humidity.

Complete Unimotor fm fan blown motor assembly

IP20 - Protected against solid objects >12mm. E.g. fingers.

2.5 Ordering information

Use the information below in the illustration to create an order code for a Unimotor
The details in the band are an example of an order reference (Std = Standard selection, Opt = Optional selection)

095	U	4	D	60	0	V
Frame size	Motor voltage	Peak torque selection	Stator length	Winding speed	Brake	Connection type*
	075 -190 frame	075 -190 frame	075 frame	075 frame	075 -190 frame	075 -190 frame
075	U = 400V	4 =Peak torque	D	60 = 6000 rpm	0 = Not fitted (Std)	A = Power and Signal 90° fixed
095			095 frame	095 frame	1 = Parking brake fitted 24Vdc	B = Power and Signal 90° rotatable
115			D	60 = 6000 rpm		
142			115 frame	115 frame	5 = High energy dissipation parking brake	C = Power 90° rotatable and Signal vertical
190			D	40 = 4000 rpm		
			E	142 frame	X = Special	V = Power and Signal vertical
			142 frame	30 = 3000 rpm		
			C	190 frame		X = Special
			E	C & E: 30 = 3000 rpm		
			190 frame	F: 20 = 2000 rpm		
			C			
			E			
			F			

* 142 and 190 frame motors the power plug will be size 1.5

A
Output shaft
075 -190 frame
A = Keyed
B = Plain shaft
X = Special

MA	
Feedback device	
075 - 142 frame	
AE = Resolver	
CA = Incremental Encoder	4096 ppr
MA = Incremental Encoder	2048 ppr
KA = Incremental Encoder	1024 ppr
EB = Optical Absolute Multi-turn	EQN 1325
EC = Inductive Absolute Multi-turn	EQI 1331
FB = Optical Absolute Single turn	ECN 1313
FC = Inductive Absolute Single turn	ECI 1319
RA = Optical SinCos Multi-turn	SRM 50
SA = Optical SinCos Single turn	SRS 50
XX = Special	
190 frame only	
AE = Resolver	
CA = Incremental Encoder (Std)	4096 ppr
MA = Incremental Encoder	2048 ppr
EB = Optical Absolute Multi-turn	EQN 1325
FB = Optical Absolute Single turn	ECN 1313
RA = Optical SinCos Multi-turn	SRM 50
SA = Optical SinCos Single turn	SRS 50
XX = Special	

A
Inertia
075 -190 frame
A = Standard
B = High

100		220	
PCD		**Shaft diameter**	
075 frame			
075	Std	19.0	D Std
095 frame			
100	Std	22.0	D Std
115 frame			
115	Std	24.0	D Std
		28.0	E Std
142 frame			
165	Std	28.0	C/E Std
190 frame			
215	Std	32.0	C Std
		38.0	E/F Std

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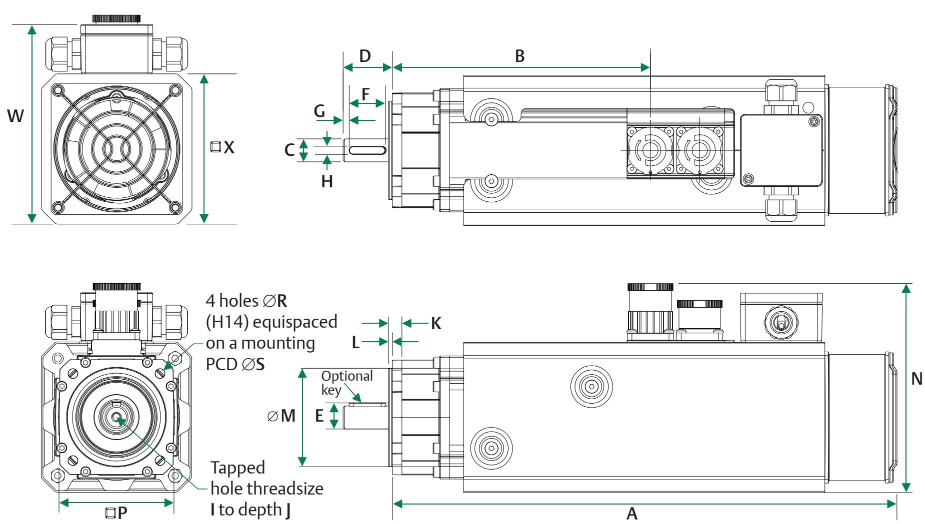
2.6 Dimensions

2.6.1 Frame size 075

Δt= 100°C winding 40°C maximum ambient
All data subject to +/-10% tolerance



Fan box performance

	Motor frame size (mm)	075U4
	Voltage (Vrms)	380 - 480
		Force - air cooling
	Frame length	D
	Continuous stall torque (Nm)	5.2
	Peak torque (Nm)	11.7
	Standard inertia (kgcm²)	2.0
	High inertia (kgcm²)	2.4
	Winding thermal time const. (s)	100
Speed 6000 (rpm)	Kt (Nm/A) =	0.80
	Ke (V/krpm) =	49.00
	Rated torque (Nm)	4.0
	Stall current (A)	6.5
	Rated power (kW)	2.51
	R (ph-ph) (Ω)	1.90
	L (ph-ph) (mH)	4.80

Stall torque, rated torque and power relate to maximum continuous operation tested in a 20°C ambient at 12kHz drive switching frequency

All other figures relate to a 20°C motor temperature. Maximum intermittent winding temperature is 140°C

Fan rating

Voltage	Free air flow	Fan curent rating
230 Vac	50 m³/h	0.05A

Clearance behind fan box: 40mm

Fan blown motor dimension (mm)

Drawing number: IM/0677/GA

	Unbraked length		Braked length		Flange thickness	Register length	Register diameter	Fan box overall height	Flange square	Fixing hole diameter	Fixing hole PCD	Fan box housing	Mounting bolts
	A (± 5.0)	B (± 1.0)	A (± 5.0)	B (± 1.0)	K (± 0.5)	L (± 0.1)	M (j6)	W (± 3.0)	P (± 0.1)	R (H14)	S (± 0.4)	X (± 1.0)	
075D	397.4	247.2	442.4	292.2	5.8	2.40	60.0	121.6	70.0	5.8	75.0	91.6	M5

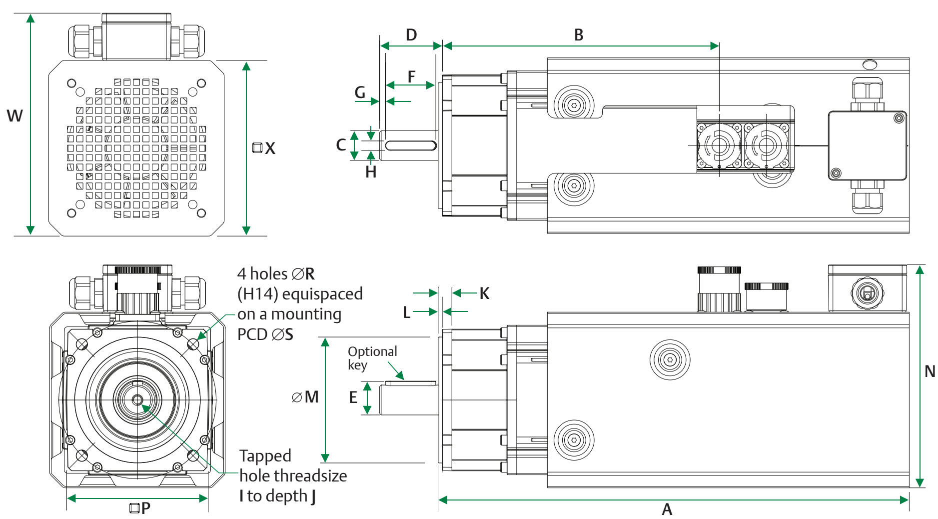
Connector height (mm)

Connection type	Overall height
	N (± 1.0)
A	126.5
B	134.0
C	134.0
V	126.5

Shaft dimensions (mm)

	Shaft diameter	Shaft length	Key height	Key length	Key to shaft end	Key width	Tapped hole thread size	Tapped hole diameter
	C (j6)	D (± 0.45)	E (+0.009 / -0.134)	F (± 0.25)	G (± 1.1)	H (h9)	I	J (± 1.0)
19.0 D Std	19.0	40.0	21.5	32.0	3.6	6.0	M6 x 1.0	17.0

2.6.2 Frame size 095



Δt= 100°C winding 40°C maximum ambient

All data subject to +/-10% tolerance

Fan box performance

Motor frame size (mm)		095U4
	Voltage (Vrms)	380 - 480
		Force - air cooling
	Frame length	D
	Continuous stall torque (Nm)	9.0
	Peak torque (Nm)	22.5
	Standard inertia (kgcm²)	5.1
	High inertia (kgcm²)	7.0
	Winding thermal time const. (s)	221
Speed 6000 (rpm)	Kt (Nm/A) =	0.80
	Ke (V/krpm) =	49.00
	Rated torque (Nm)	5.8
	Stall current (A)	11.3
	Rated power (kW)	8.3
	R (ph-ph) (Ω)	0.62
	L (ph-ph) (mH)	2.70

Stall torque, rated torque and power relate to maximum continuous operation tested in a 20°C ambient at 12kHz drive switching frequency

All other figures relate to a 20°C motor temperature. Maximum intermittent winding temperature is 140°C

Fan rating

Voltage	Free air flow	Fan curent rating
230 Vac	67 m³/h	0.05A

Clearance behind fan box: 40mm

Fan blown motor dimension (mm)

Drawing number: IM/0678/GA

	Unbraked length		Braked length		Flange thickness	Register length	Register diameter	Fan box overall height	Flange square	Fixing hole diameter	Fixing hole PCD	Fan box housing	Mounting bolts
	A (± 5.0)	B (± 1.0)	A (± 5.0)	B (± 1.0)	K (± 0.5)	L (± 0.1)	M (j6)	W (± 3.0)	P (± 0.1)	R (H14)	S (± 0.4)	X (± 1.0)	
095D	386.6	265.9	431.6	310.9	5.9	2.80	80.0	141.6	90.0	7.0	100.0	111.6	M6

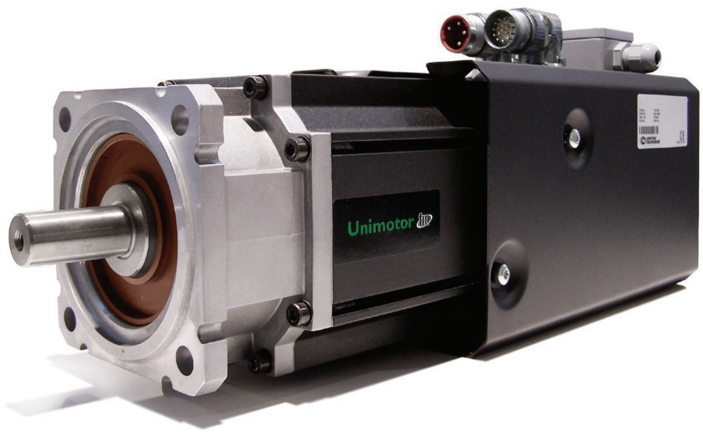
Connector height (mm)

Connection type	Overall height
	N (± 1.0)
A	139.5
B	147.0
C	147.0
V	139.5

Shaft dimensions (mm)

	Shaft diameter	Shaft length	Key height	Key length	Key to shaft end	Key width	Tapped hole thread size	Tapped hole diameter
	C (j6)	D (± 0.45)	E (+0.009 / -0.134)	F (± 0.25)	G (± 1.1)	H (h9)	I	J (± 1.0)
22.0 D Std	22.0	50.0	24.5	40.0	4.6	6.0	M8 x 1.25	20.0

2.6.3 Frame size 115



Δt= 100°C winding 40°C maximum ambient
All data subject to +/-10% tolerance

Fan box performance

Motor frame size (mm)	115U4	
Voltage (Vrms)	380 - 480	
	Force - air cooling	
Frame length	D	E
Continuous stall torque (Nm)	15.2	20.1
Peak torque (Nm)	37.2	45.9
Standard inertia (kgcm²)	11.4	13.8
High inertia (kgcm²)	16.6	18.9
Winding thermal time const. (s)	217	241
Speed 4000 (rpm) Kt (Nm/A) =	1.20	
Ke (V/krpm) =	73.50	
Rated torque (Nm)	12.0	16.1
Stall current (A)	12.7	16.8
Rated power (kW)	5.03	6.74
R (ph-ph) (Ω)	0.73	0.57
L (ph-ph) (mH)	4.70	3.90

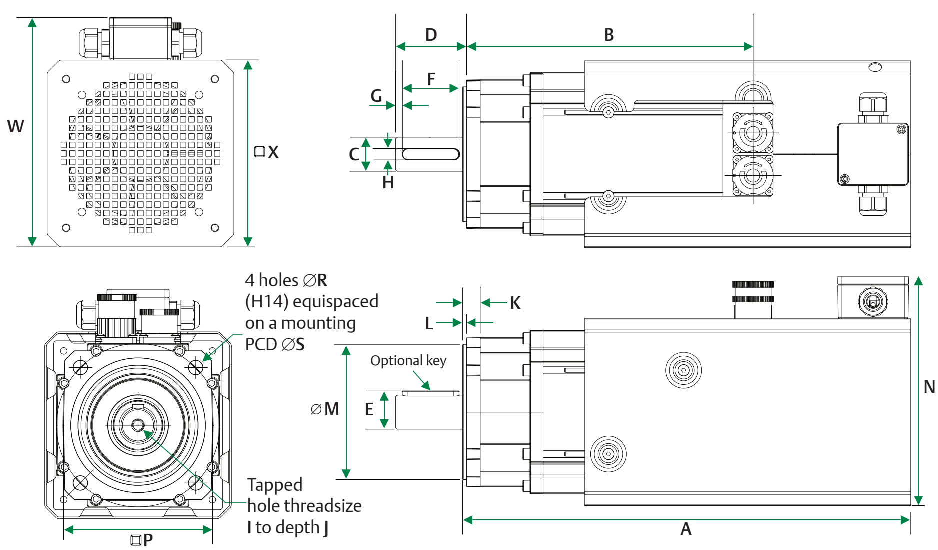
Stall torque, rated torque and power relate to maximum continuous operation tested in a 20°C ambient at 12kHz drive switching frequency

All other figures relate to a 20°C motor temperature. Maximum intermittent winding temperature is 140°C

Fan rating

Voltage	Free air flow	Fan curent rating
230 Vac	160 m³/h	0.08A

Clearance behind fan box: 40mm



Fan blown motor dimension (mm)

Drawing number: IM/0679/GA

	Unbraked length		Braked length		Flange thickness	Register length	Register diameter	Fan box overall height	Flange square	Fixing hole diameter	Fixing hole PCD	Fan box housing	Mounting bolts
	A (± 5.0)	B (± 1.0)	A (± 5.0)	B (± 1.0)	K (± 0.5)	L (± 0.1)	M (j6)	W (± 3.0)	P (± 0.1)	R (H14)	S (± 0.4)	X (± 2.0)	
115D	403.0	292.0	448.0	337.0	9.6	2.80	95.0	161.6	105.0	10.0	115.0	131.6	M8
115E	433.0	322.0	478.0	367.0									

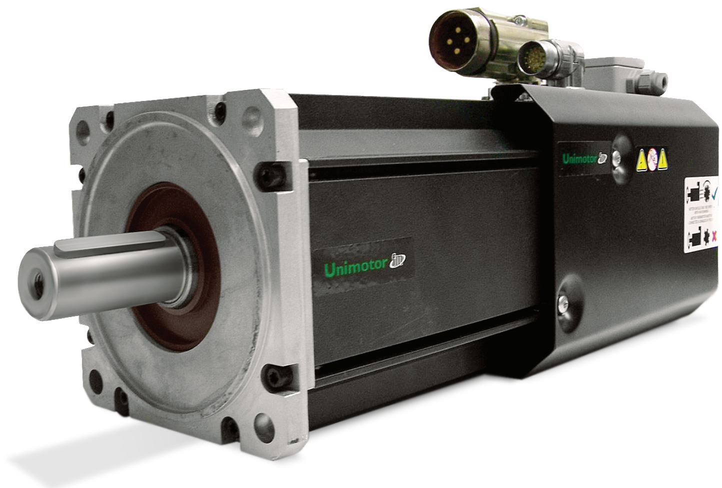
Connector height (mm)

Connection type	Overall height
	N (± 1.0)
A	157.0
B	164.5
C	164.5
V	157.0

Shaft dimensions (mm)

	Shaft diameter	Shaft length	Key height	Key length	Key to shaft end	Key width	Tapped hole thread size	Tapped hole diameter
	C (j6)	D (± 0.45)	E (+0.009 / -0.134)	F (± 0.25)	G (± 1.1)	H (h9)	I	J (± 1.0)
24.0 D Std	24.0	50.0	27.0	40.0	4.6	8.0	M8 x 1.25	20.0
28.0 E Std	28.0	60.0	31.0	50.0	4.6	8.0	M10 x 1.5	23.0

2.6.4 Frame size 142



Δt= 100°C winding 40°C maximum ambient

All data subject to +/-10% tolerance

Fan box performance

		Motor frame size (mm)	142U4	
		Voltage (Vrms)	380 - 480	
			Force - air cooling	
		Frame length	C	E
		Continuous stall torque (Nm)	18.9	29.5
		Peak torque (Nm)	45.9	70.2
		Standard inertia ($kgcm^2$)	22.2	35.4
		High inertia ($kgcm^2$)	36.5	49.7
		Winding thermal time const. (s)	275	365
Speed 3000 (rpm)		Kt (Nm/A) =	1.60	
		Ke (V/krpm) =	98.00	
		Rated torque (Nm)	16.1	25.0
		Stall current (A)	11.8	18.4
		Rated power (kW)	5.06	7.85
		R (ph-ph) (Ω)	0.94	0.44
		L (ph-ph) (mH)	8.30	5.77

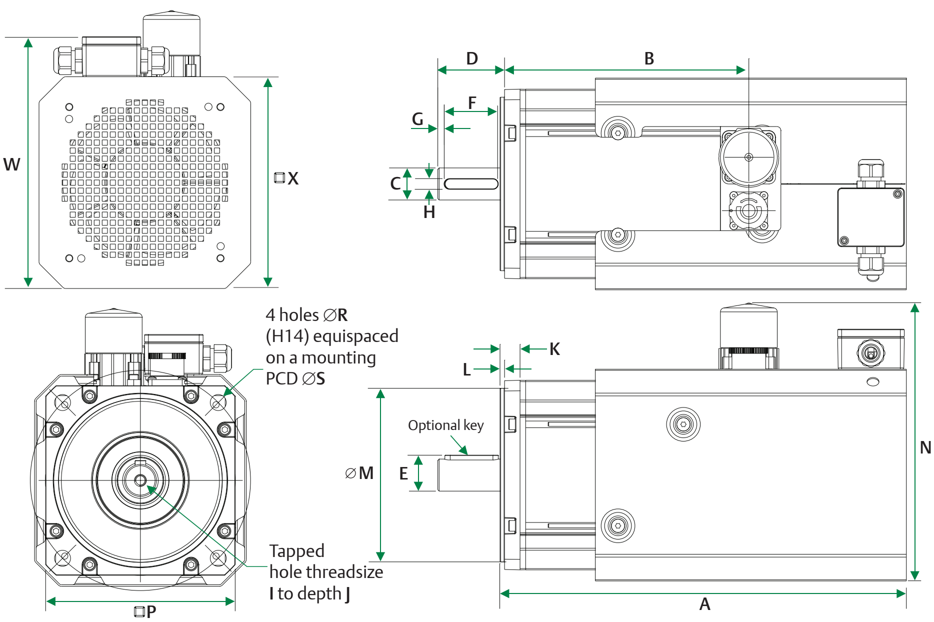
Stall torque, rated torque and power relate to maximum continuous operation tested in a 20°C ambient at 12kHz drive switching frequency

All other figures relate to a 20°C motor temperature. Maximum intermittent winding temperature is 140°C

Fan rating

Voltage	Free air flow	Fan curent rating
230 Vac	160 m^3/h	0.08A

Clearance behind fan box: 50mm



Fan blown motor dimension (mm)

Drawing number: IM/0680/GA

	Unbraked length		Braked length		Flange thickness	Register length	Register diameter	Fan box overall height	Flange square	Fixing hole diameter	Fixing hole PCD	Fan box housing	Mounting bolts
	A (± 5.0)	B (± 1.0)	A (± 5.0)	B (± 1.0)	K (± 0.5)	L (± 0.1)	M (j6)	W (± 3.0)	P (± 0.1)	R (H14)	S (± 0.4)	X (± 2.0)	
142C	367.0	249.7	412.0	294.7	11.6	3.4	130.0	188.1	142.0	12.0	165.0	158.6	M10
142E	427.0	309.7	472.0	354.7									

Connector height (mm)

Connection type	Overall height
	N (± 1.0)
A	184.0
B	191.5
C	191.5
V	184.0

Shaft dimensions (mm)

	Shaft diameter	Shaft length	Key height	Key length	Key to shaft end	Key width	Tapped hole thread size	Tapped hole diameter
	C (j6)	D (± 0.45)	E (+0.009 / -0.294)	F (± 0.25)	G (± 1.1)	H (h9)	I	J (± 1.0)
28.0 C/E Std	28.0	60.0	31.0	50.0	4.6	8.0	M10 x 1.5	23.0

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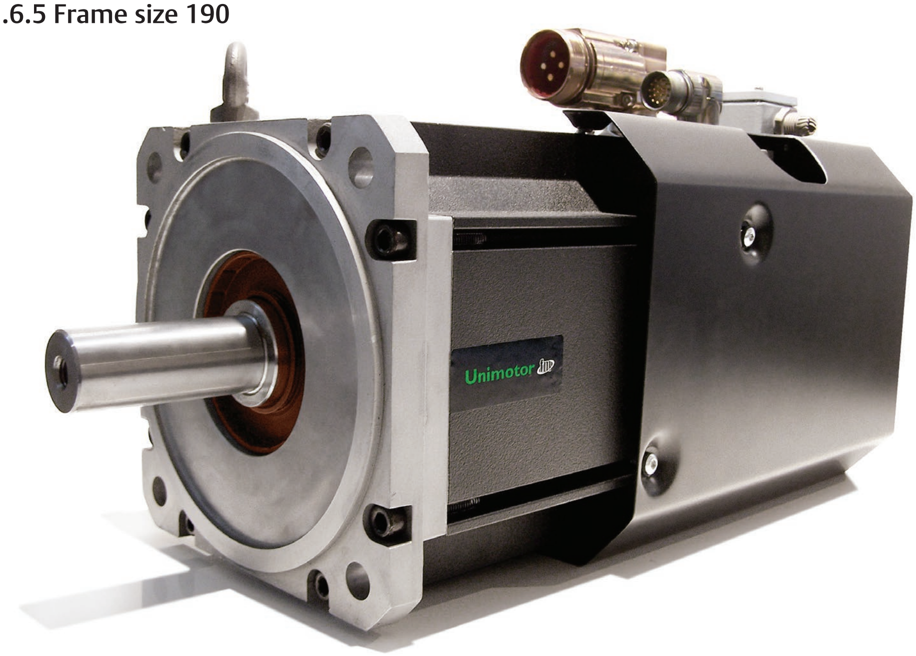
2.6.5 Frame size 190



Δt= 100°C winding 40°C maximum ambient
All data subject to +/-10% tolerance

Fan box performance

Motor frame size (mm)	190U4		
Voltage (Vrms)	380 - 480		
	Force - air cooling		
Frame length	C	E	F
Continuous stall torque (Nm)	41.0	68.0	79.0
Peak torque (Nm)	93.3	151.6	176.2
Standard inertia (kgcm²)	67.5	105.0	123.1
High inertia (kgcm²)	112.7	150.2	168.3
Winding thermal time const. (s)	241	281	319
Speed 2000 (rpm) Kt (Nm/A) =			2.40
Ke (V/krpm) =			147.0
Rated torque (Nm)			66.5
Stall current (A)			32.9
Rated current (A)			27.7
Rated power (kW)			13.9
R (ph-ph) (Ω)			0.30
L (ph-ph) (mH)			7.16
Speed 3000 (rpm) Kt (Nm/A) =	1.60		
Ke (V/krpm) =	98.00		
Rated torque (Nm)	35.5	55.0	
Stall current (A)	25.6	42.5	
Rated power (kW)	11.15	17.30	
R (ph-ph) (Ω)	0.41	0.17	
L (ph-ph) (mH)	7.35	3.86	

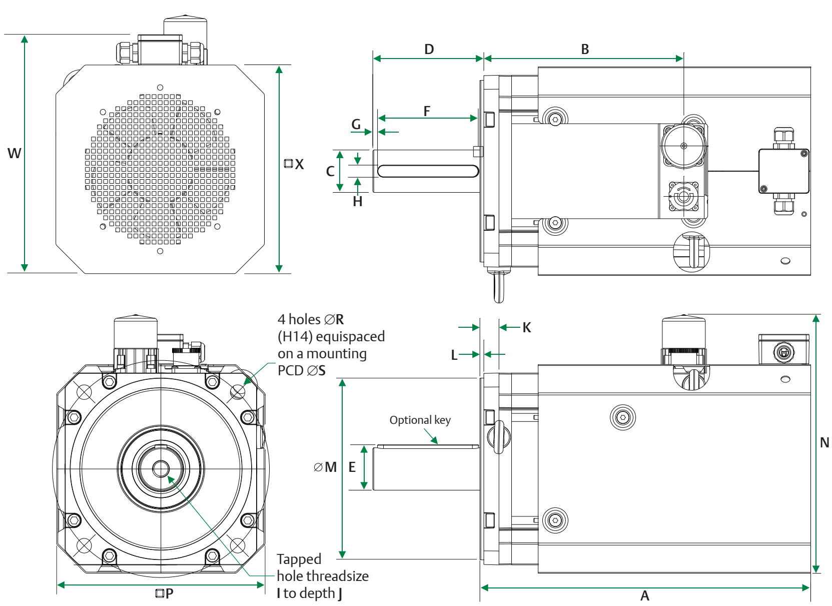
Stall torque, rated torque and power relate to maximum continuous operation tested in a 20°C ambient at 12kHz drive switching frequency

All other figures relate to a 20°C motor temperature. Maximum intermittent winding temperature is 140°C

Fan rating

Voltage	Free air flow	Fan curent rating
230 Vac	325 m³/h	0.13A

Clearance behind fan box: 60mm



Fan blown motor dimension (mm)

Drawing number: IM/0681/GA

	Unbraked length		Braked length		Flange thickness	Register length	Register diameter	Fan box overall height	Flange square	Fixing hole diameter	Fixing hole PCD	Fan box housing	Mounting bolts
	A (± 5.0)	B (± 1.0)	A (± 5.0)	B (± 1.0)	K (± 0.5)	L (± 0.1)	M (j6)	W (± 3.0)	P (± 0.1)	R (H14)	S (± 0.4)	X (± 2.0)	
190C	377.8	252.1	458.6	332.9	15.0	3.90	180.0	236.6	190.0	14.5	215.0	206.6	M12
190E	431.7	306.0	512.5	386.8									
190F	458.6	332.9	539.5	413.8									

Connector height (mm)

Connection type	Overall height
	N (± 1.0)
A	253.0
B	260.5
C	260.5
V	240.0

Shaft dimensions (mm)

	Shaft diameter	Shaft length	Key height	Key length	Key to shaft end	Key width	Tapped hole thread size	Tapped hole diameter
	C (j6)	D (± 0.45)	E (+0.018 / -0.288)	F (± 0.25)	G (± 1.1)	H (h9)	I	J (± 1.0)
32.0 C Std	32.0 (k6)	80.0	35.0	70.0	4.6	10.0	M12 x 1.75	29.0
38.0 E/F Std	38.0 (k6)	80.0	41.0	70.0	4.6	10.0	M12 x 1.75	29.0

3 Introduction to Unimotor hd

3.1 Overview

Unimotor hd is Control Techniques' high dynamic brushless AC servo motor range, designed for operation with Digitax ST, Unidrive SP, Unidrive M and Epsilon EP drives. Unimotor hd provides an exceptionally compact, low inertia solution for applications where very high torque is required during rapid acceleration and deceleration profiles. The Unimotor hd torque profile is matched to Digitax ST servo drives, providing up to 300% peak overload for maximum dynamic performance.

3.1.1 Engineering excellence, innovation and reliability

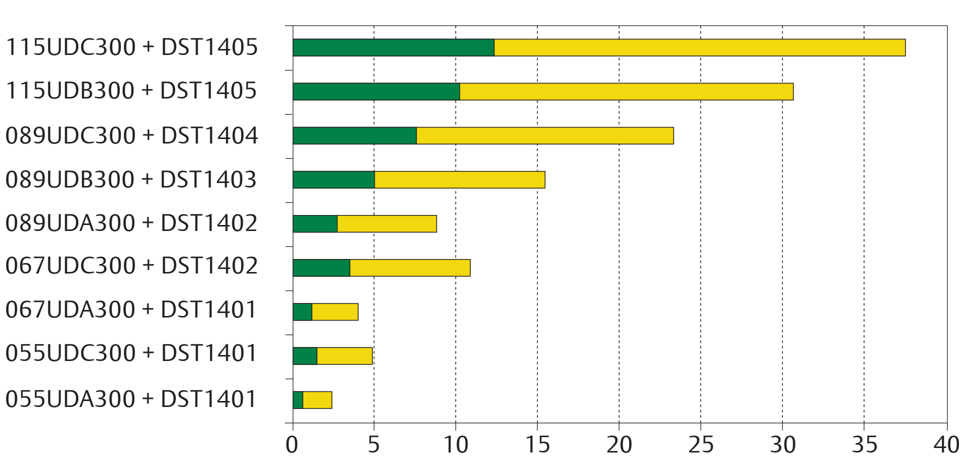
Unimotor hd has been developed by a dedicated team using our design process that prioritises product innovation, performance and reliability. This enables new ideas to be quickly evaluated, prototyped and tested using a suite of in-house development and modelling software tools. As a result Unimotor hd incorporates a number of unique performance enhancing design features with several patents pending. Unimotor hd "raises the bar" in terms of both performance and quality.

3.1.2 Key features

Unimotor hd is suitable for a wide range of industrial applications, due to its extensive features.

- Torque range: 0.72Nm to 85.0Nm
- High torque to inertia ratio for high dynamic performance
- Compact but powerful
- High energy dissipation brakes
- IP65 conformance: sealed against water spray and dust when mounted and connected
- Segmented stator design
- World class performance
- Supported by rigorous testing for performance and reliability
- Winding to suit 400V and 220V
- Rated speeds include 2000rpm, 3000rpm, 4000rpm and 6000rpm
- Larger shafts to increase torsional rigidity

3.1.3 Torque performance ■ Stall torque ■ Peak torque (3000 rpm)



3.1.6 Conformance and standards

FM 30610

3.1.4 The ultimate motor and drive combinations

Control Techniques drive and motor combinations provide an optimised system in terms of ratings, performance, cost and ease of use. Unimotor fm motors fitted with high resolution SinCos or Absolute encoders are pre-loaded with the motor "electronic nameplate" data during the manufacturing process. This data can be read by Control Techniques' servo drives and used to automatically optimise the drive settings. This feature simplifies commissioning and maintenance, ensures consistent performance and saves time.

For further information on Control Techniques servo drives, please refer to the Digitax ST, Unidrive SP and Unidrive M brochures.

3.1.5 Accuracy and resolution to suit your application requirements

Choosing the right feedback device for your application is critical in getting optimum performance. Unimotor fm has a range of feedback options that offer different levels of accuracy and resolution to suit most applications:

- Resolver: robust for extreme applications and conditions - low accuracy, medium resolution
- Incremental encoder: high accuracy, medium resolution
- Inductive Absolute: medium accuracy, medium resolution, single turn and multi-turn
- Optical SinCos/Absolute: high accuracy, high resolution, single turn and multi-turn
- Hiperface (SICK) and EnDAT (Heidenhain) protocols supported

3.2 Quick reference table

Frame size	PCD (mm)	Unimotor fm	
055	63	0.72 1.65	0.14 0.36
067	75	1.45 3.70	0.30 0.75
089	100	3.20 8.00	0.87 2.34
115	130	5.80 18.80	2.42 8.38
142	165	25.0 38.0	17.0 27.2
190	230	52.0 85.0	54.6 103.5

Stall	0	0.5	1.0	3.0	5.0	8.0	10.0	15.0	20.0	30	60	85.0	(Nm)
Inertia	0	0.1	0.2	0.7	1.5	2.5	6.5	8.0	9.0	20.0	60.0	103.5	(kgcm²)

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3.3 Unimotor ordering code Information

Use the information below in the illustration to create an order code for a Unimotor.
The details in the band are an example of an order reference.

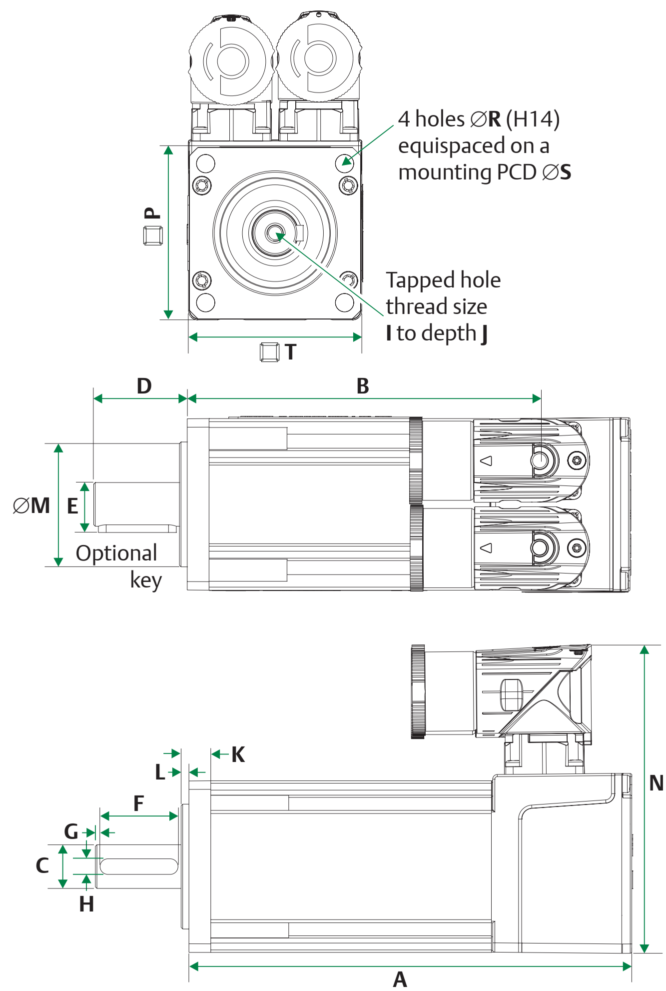
089	UD	B	30	5	B	A	CA		A
Frame size	Motor voltage	Stator length	Rated speed*	Brake	Connection type	Output shaft	Feedback device		Inertia
		055 - 089 Frame	055 Frame	055 Frame			055 - 067 Frame		
055	ED = 220V	A	30 = 3000 rpm	0 = Not fitted	B = Power and Signal 90° rotatable	A = Round with key	AR = Resolver		A = Standard
067	UD = 480V	B	60 = 6000 rpm	1 = Parking brake			CR = Incremental Encoder (Renco)	4096 ppr (R35i)	E = Standard + Lifting Brackets
089		C	089 Frame			B = Round Plain shaft	EM = Inductive Absolute Multi turn	EQI 1130	
115		115 Frame	30 = 3000 rpm	X = Special	J = Power size 1.5 and Signal 90° rotatable on 142		FM = Inductive Absolute Single turn	ECI 1118	
142		D	40 = 4000 rpm	067 - 190 Frame			LM = Inductive Absolute Multi turn (Serial comms only)	EQI 1130	
190		142 Frame	60 = 6000 rpm	0 = Not fitted		F = Full key and half key supplied separately	NM = Inductive Absolute Single turn (Serial comms only)	ECI 1118	
		C	115 Frame	5 = High energy dissipation Parking brake			TL = Optical Sincos Multi turn	SKM 36	
		D	20 = 2000 rpm				UL = Optical Sincos Single turn	SKS 36	
		E	30 = 3000 rpm				XX = Special		
		190 Frame	142 Frame	X = Special		X = Special	089 Frame		
		C	10 = 1000 rpm				AE = Resolver		
		D	15 = 1500 rpm				CA = Incremental Encoder (SICK)	4096 ppr (CFS50)	
		F	20 = 2000 rpm				EB = Optical Absolute Multi turn	EQN 1325	
			30 = 3000 rpm				FB = Optical Absolute Single turn	ECN 1313	
			190 Frame				EC = Inductive Absolute Multi turn	EQI 1331	
			10 = 1000 rpm				FC = Inductive Absolute Single turn	ECI 1319	
			15 = 1500 rpm				LC = Inductive Absolute Multi turn (Serial comms only)	EQI 1331	
			20 = 2000 rpm				NC = Inductive Absolute Single turn (Serial comms only)	ECI 1319	
							RA = Optical Sincos Multi turn	SRM 50 (GEN 2)	
							SA = Optical Sincos Single turn	SRS 50 (GEN 2)	
							XX = Special		
							115 - 190 Frame		
							AE = Resolver		
							CA = Incremental Encoder (SICK)	4096 ppr (CFS50)	
							EB = Optical Absolute Multi turn	EQN 1325	
							FB = Optical Absolute Single turn	ECN 1313	
							EC = Inductive Absolute Multi turn	EQI 1331	
							FC = Inductive Absolute Single turn	ECI 1319	
							LC = Inductive Absolute Multi turn (Serial comms only)	EQI 1331	
							NC = Inductive Absolute Single turn (Serial comms only)	ECI 1319	
							RA = Optical Sincos Multi turn	SRM 50 (GEN 2)	
							SA = Optical Sincos Single turn	SRM 50 (GEN 2)	
							XX = Special		

* Not all rated speeds are available on all frame lengths

3.4 Dimensions

3.4.1 Frame size 055 For 3 Phase VPWM drives

Motor frame size (mm)		055ED			055UD		
Voltage (Vrms)		200-240			380-480		
Frame length		A	B	C	A	B	C
Continuous Stall Torque (Nm)		0.72	1.18	1.65	0.72	1.18	1.65
Peak Torque (Nm)		2.88	4.72	6.60	2.88	4.72	6.60
Inertia (kgcm²)		0.14	0.25	0.36	0.14	0.25	0.36
Winding thermal time constant (s)		34.0	38.0	42.0	34.0	38.0	42.0
Motor weight unbraked (kg)		1.20	1.50	1.80	1.20	1.50	1.80
Motor weight braked (kg)		1.60	1.90	2.20	1.6	1.90	2.20
Number of poles		8	8	8	8	8	8
Speed 3000 (rpm)	Kt (Nm/A) =	0.74	0.87	0.91	0.74	1.49	1.65
	Ke (V/krpm) =	45.00	52.50	55.00	45.00	90.00	100.00
Rated torque (Nm)		0.70	1.05	1.48	0.70	1.05	1.48
Stall current (A)		0.97	1.36	1.81	0.97	0.79	1.00
Rated power (kW)		0.22	0.33	0.46	0.22	0.33	0.46
R (ph-ph) (Ω)		28.00	14.12	9.53	28.00	45.00	31.00
L (ph-ph) (mH)		50.00	32.00	23.00	50.00	100.00	75.00
Speed 6000 (rpm)	Kt (Nm/A) =	0.45	0.43	0.48	0.74	0.79	0.83
	Ke (V/krpm) =	27.00	26.00	29.00	45.00	47.50	50.00
Rated torque (Nm)		0.68	0.90	1.20	0.68	0.90	1.20
Stall current (A)		1.61	2.74	3.44	0.97	1.49	1.99
Rated power (kW)		0.43	0.57	0.75	0.43	0.57	0.75
R (ph-ph) (Ω)		8.50	3.55	2.38	28.00	10.70	7.80
L (ph-ph) (mH)		16.00	8.20	6.30	50.00	25.00	20.00



Δt= 100°C winding 40°C maximum ambient

All data subject to +/-10% tolerance

Stall torque, rated torque and power relate to maximum continuous operation tested in a 20°C ambient at 12kHz drive switching frequency

All other figures relate to a 20°C motor temperature.

Maximum intermittent winding temperature is 140°C

Motor dimension (mm)

Drawing number: GM496400

	Feedback AR, CR, EM/FM				Flange thickness	Register length	Register diameter	Overall height	Flange square	Fixing hole diameter	Fixing hole PCD	Motor housing	Mounting bolts
	Unbraked length		Braked length										
	A	B	A	B	K	L	M (j6)	N	P	R (H14)	S	T	
055A	118.0	90.0	158.0	130.0									
055B	142.0	114.0	182.0	154.0	7.0	2.5	40.0	99.0	55.0	5.8	63.0	55.0	M5
055C	166.0	138.0	206.0	178.0									

Shaft dimensions (mm)

	Shaft diameter	Shaft length	Key height	Key length	Key to shaft end	Key width	Tapped hole thread size	Tapped hole depth
	C (j6)	D	E	F	G	H (h9)	I	J
14.0 Std	14	30.0	16.0	25.0	1.5	5.0	M5	12.5

NOTE: 3D drawings of the Unimotor fm and Unimotor hd motors can be downloaded from: http://motors.controltechniques.com/

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3.4.2 Frame size 067 For 3 Phase VPWM drives

Motor frame size (mm)		067ED			067UD		
Voltage (Vrms)		200-240			380-480		
Frame length		A	B	C	A	B	C
Continuous Stall Torque (Nm)		1.45	2.55	3.70	1.45	2.55	3.70
Peak Torque (Nm)		4.35	7.65	11.10	4.35	7.65	11.10
Inertia (kgcm²)		0.30	0.53	0.75	0.30	0.53	0.75
Winding thermal time constant (s)		54	61	65	54	61	65
Motor weight unbraked (kg)		2.00	2.60	3.20	2.00	2.60	3.20
Motor weight braked (kg)		2.70	3.3	3.90	2.70	3.3	3.90
Number of poles		10	10	10	10	10	10
Speed 3000 (rpm)	Kt (Nm/A) =	0.93			0.80	1.60	1.60
	Ke (V/krpm) =	57.00			49.00	98.00	98.00
	Rated torque (Nm)	1.40	2.45	3.50	1.40	2.45	3.50
	Stall current (A)	1.56	2.74	3.98	1.81	1.59	2.31
	Rated power (kW)	0.44	0.77	1.10	0.44	0.77	1.10
	R (ph-ph) (Ω)	14.92	4.88	3.33	11.69	15.20	13.04
	L (ph-ph) (mH)	45.43	17.40	12.70	35.18	54.20	48.65
Speed 6000 (rpm)	Kt (Nm/A) =	0.47			0.8		
	Ke (V/krpm) =	28.50			49.00		
	Rated torque (Nm)	1.30	2.20		1.30	2.20	3.10
	Stall current (A)	3.12	5.48		1.81	3.19	4.63
	Rated power (kW)	0.82	1.38		0.82	1.38	1.95
	R (ph-ph) (Ω)	3.86	1.22		11.69	3.79	2.68
	L (ph-ph) (mH)	11.06	4.35		35.18	13.60	10.20

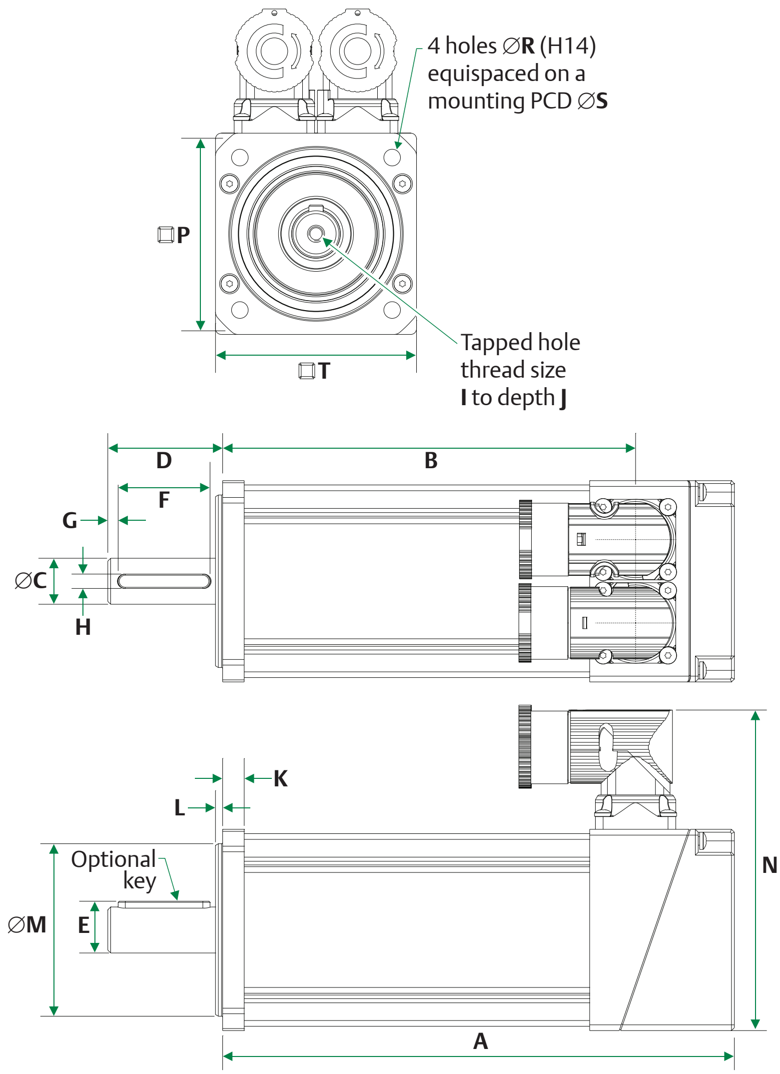
Δt= 100°C winding 40°C maximum ambient

All data subject to +/-10% tolerance

Stall torque, rated torque and power relate to maximum continuous operation tested in a 20°C ambient at 12kHz drive switching frequency

All other figures relate to a 20°C motor temperature.

Maximum intermittent winding temperature is 140°C



Motor dimension (mm)

Drawingnumber:IM/0694/GA

	Feedback AR, CR, EM/FM, LM/NM				Flange thickness	Register length	Register diameter	Overall height	Flange square	Fixing hole diameter	Fixing hole PCD	Motor housing	Mounting bolts
	Unbraked length		Braked length										
	A (± 0.9)	B (± 1.0)	A (± 0.9)	B (± 1.0)	K (± 0.5)	L (± 0.1)	M (j6)	N (± 0.3)	P (± 0.3)	R (H14)	S (± 0.4)	T (± 0.4)	
067A	142.9	109.0	177.9	144.0	7.5	2.50	60.0	111.5	70.0	5.8	75.0	67.00	M5
067B	172.9	139.0	207.9	174.0									
067C	202.9	169.0	237.9	204.0									

	Feedback TL/UL			
	Unbraked length	Braked length	Unbraked length	Braked length
	A (± 0.9)	A (± 1.0)	A (± 0.9)	A (± 1.0)
067A	157.7	123.5	192.7	158.5
067B	187.7	153.5	222.7	188.5
067C	217.7	183.5	252.7	218.5

Shaft dimensions (mm)

	Shaft diameter	Shaft length	Key height	Key length	Key to shaft end	Key width	Tapped hole thread size	Tapped hole depth
	C (j6)	D (± 0.45)	E (IEC 72-1)	F (± 0.25)	G (± 1.1)	H (h9)	I	J (± 0.1)
14.0 Std	14.0	30.0	16.0	22.0	3.6	5.0	M5 x 0.8	13.5

NOTE: 3D drawings of the Unimotor fm and Unimotor hd motors can be downloaded from: http://motors.controltechniques.com/

3.4.3 Frame size 089 For 3 Phase VPWM drives

Motor frame size (mm)	089ED			089UD		
Voltage (Vrms)	200-240			380-480		
Frame length	A	B	C	A	B	C
Continuous Stall Torque (Nm)	3.20	5.50	8.00	3.20	5.50	8.00
Peak Torque (Nm)	9.60	16.50	24.00	9.60	16.50	24.00
Inertia (kgcm²)	0.87	1.61	2.34	0.87	1.61	2.34
Winding thermal time constant (s)	85	93	98	85	93	98
Motor weight unbraked (kg)	3.30	4.40	5.50	3.30	4.40	5.50
Motor weight braked (kg)	4.30	5.40	6.50	4.30	5.40	6.50
Number of poles	10	10	10	10	10	10
Speed 3000 (rpm) Kt (Nm/A) =	0.93			1.60		
Ke (V/krpm) =	57.00			98.00		
Rated torque (Nm)	3.00	4.85	6.90	3.00	4.85	6.90
Stall current (A)	3.44	5.91	8.60	2.00	3.44	5.00
Rated power (kW)	0.94	1.52	2.17	0.94	1.52	2.17
R (ph-ph) (Ω)	3.28	1.57	0.89	12.85	5.05	2.68
L (ph-ph) (mH)	21.55	11.84	7.09	80.66	38.36	21.72
Speed 4000 (rpm) Kt (Nm/A) =	0.70			1.2		
Ke (V/krpm) =	42.75			73.50		
Rated torque (Nm)	2.90	4.55	6.35	2.90	4.55	6.35
Stall current (A)	4.57	7.86	11.43	2.67	4.58	6.67
Rated power (kW)	1.21	1.91	2.66	1.21	1.91	2.66
R (ph-ph) (Ω)	2.04	0.79	0.54	6.16	2.47	1.75
L (ph-ph) (mH)	13.20	5.97	4.38	39.78	18.80	14.03
Speed 6000 (rpm) Kt (Nm/A) =	0.47			0.8		
Ke (V/krpm) =	28.50			49.00		
Rated torque (Nm)	2.65	3.80	5.00	2.65	3.80	5.00
Stall current (A)	6.88	11.83	17.20	4.00	6.88	10.00
Rated power (kW)	1.67	2.39	3.14	1.67	2.39	3.14
R (ph-ph) (Ω)	0.98	0.39	0.23	3.21	1.27	0.83
L (ph-ph) (mH)	6.24	2.96	1.89	20.16	9.59	6.66

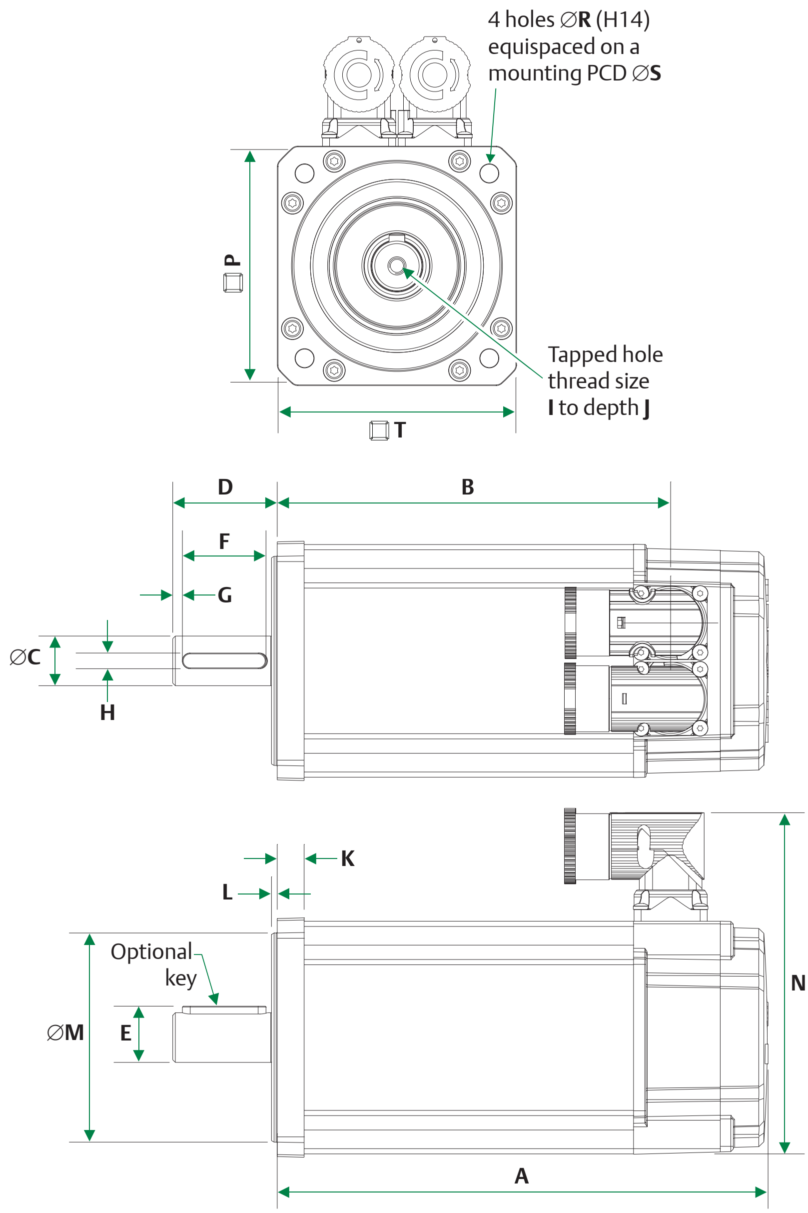
Δt= 100°C winding 40°C maximum ambient

All data subject to +/-10% tolerance

Stall torque, rated torque and power relate to maximum continuous operation tested in a 20°C ambient at 12kHz drive switching frequency

All other figures relate to a 20°C motor temperature.

Maximum intermittent winding temperature is 140°C



Motor dimension (mm)

Drawingnumber:IM/0688/GA

	Feedback EC/FC, LC/NC				Flange thickness	Register length	Register diameter	Overall height	Flange square	Fixing hole diameter	Fixing hole PCD	Motor housing	Mounting bolts
	Unbraked length		Braked length										
	A (± 0.9)	B (± 1.0)	A (± 0.9)	B (± 1.0)	K (± 0.5)	L (± 0.1)	M (j6)	N (± 1.0)	P (± 0.28)	R (H14)	S (± 0.4)	T (± 0.7)	
089A	147.8	110.5	187.9	150.6	10.3	2.20	80.0	130.5	91.0	7.00	100.0	89.0	M6
089B	177.8	140.5	217.9	180.6									
089C	207.8	170.5	247.9	210.6									

	Feedback FB, EB/CA/SA, RA		Feedback AE	
	Unbraked length	Braked length	Unbraked length	Braked length
	A (± 0.9)	A (± 0.9)	A (± 0.9)	A (± 0.9)
089A	160.8	200.9	137.8	177.9
089B	190.8	230.9	167.8	207.9
089C	220.8	260.9	197.8	237.9

Shaft dimensions (mm)

	Shaft diameter	Shaft length	Key height	Key length	Key to shaft end	Key width	Tapped hole thread size	Tapped hole depth
	C (j6)	D (± 0.45)	E (IEC 72-1)	F (± 0.25)	G (± 1.1)	H (h9)	I	J (± 0.1)
19.0 Std	19.0	40.0	21.5	32.0	3.7	6.0	M6 x 1.0	17.0

NOTE: 3D drawings of the Unimotor fm and Unimotor hd motors can be downloaded from: http://motors.controltechniques.com/

3.4.4 Frame size 115 For 3 Phase VPWM drives

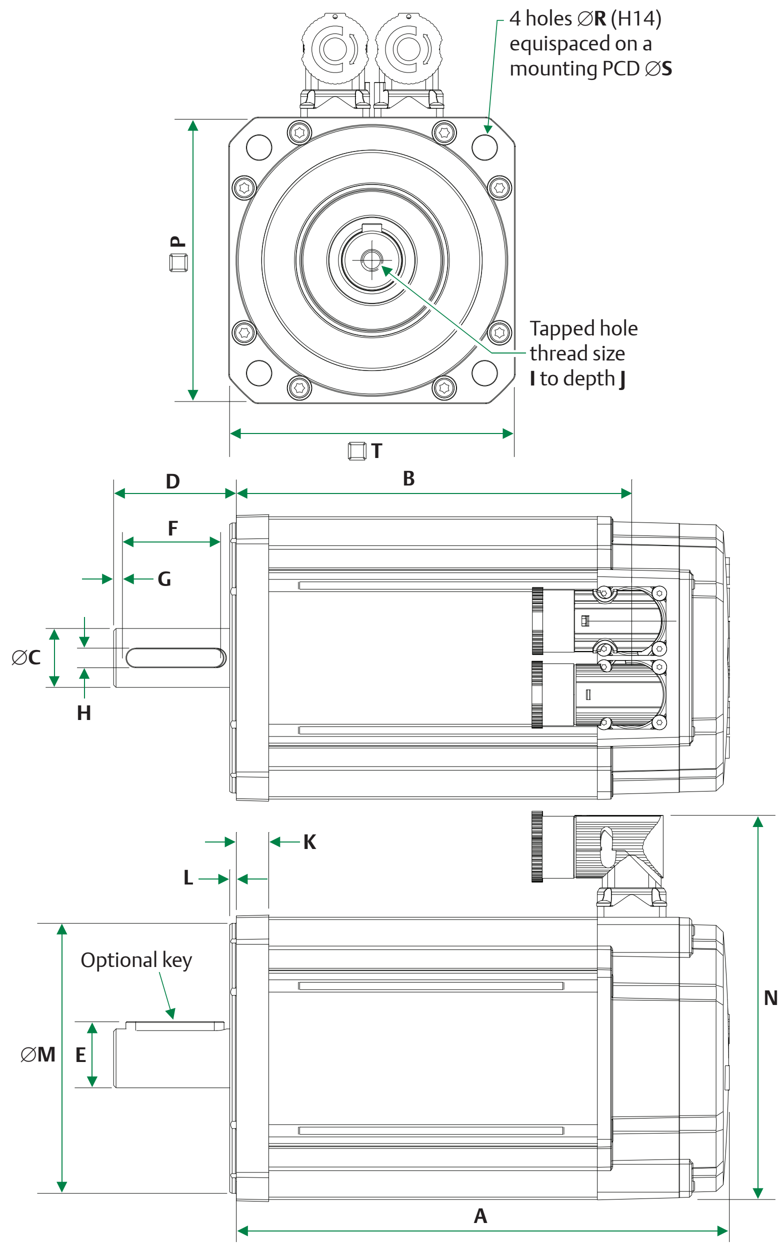
Motor frame size (mm)	115ED			115UD		
Voltage (Vrms)	200-240			380-480		
Frame length	B	C	D	B	C	D
Continuous Stall Torque (Nm)	10.20	14.60	18.80	10.20	14.60	18.80
Peak Torque (Nm)	30.60	43.80	56.40	30.60	43.80	56.40
Inertia (kgcm²)	4.41	6.39	8.38	4.41	6.39	8.38
Winding thermal time constant (s)	164	168	175	164	168	175
Motor weight unbraked (kg)	7.20	8.90	10.70	7.20	8.90	10.70
Motor weight braked (kg)	8.70	10.40	12.20	8.70	10.40	12.20
Number of poles	10	10	10	10	10	10
Speed 2000 (rpm) Kt (Nm/A) =	1.40			2.4		
Speed 2000 (rpm) Ke (V/krpm) =	85.50			147.00		
Rated torque (Nm)	8.60	11.90	15.60	8.60	11.90	15.60
Stall current (A)	7.29	10.43	13.43	4.25	6.08	7.83
Rated power (kW)	1.80	2.49	3.27	1.80	2.49	3.27
R (ph-ph) (Ω)	1.40	0.77	0.61	4.41	2.41	1.80
L (ph-ph) (mH)	12.84	7.87	6.62	40.59	24.69	19.45
Speed 3000 (rpm) Kt (Nm/A) =	0.93			1.60		
Speed 3000 (rpm) Ke (V/krpm) =	57.00			98.00		
Rated torque (Nm)	7.70	10.50		7.70	10.50	13.60
Stall current (A)	10.97	15.70		6.38	9.13	11.75
Rated power (kW)	2.42	3.30		2.42	3.30	4.27
R (ph-ph) (Ω)	0.58	0.39		1.83	1.21	0.78
L (ph-ph) (mH)	5.40	4.01		16.93	12.72	8.65

Δt= 100°C winding 40°C maximum ambient
All data subject to +/-10% tolerance

Stall torque, rated torque and power relate to maximum continuous operation tested in a 20°C ambient at 12kHz drive switching frequency

All other figures relate to a 20°C motor temperature.

Maximum intermittent winding temperature is 140°C



Motor dimension (mm)

Drawingnumber:IM/0689/GA

	Feedback EC/FC, LC/NC				Flange thickness	Register length	Register diameter	Overall height	Flange square	Fixing hole diameter	Fixing hole PCD	Motor housing	Mounting bolts
	Unbraked length		Braked length										
	A (± 0.9)	B (± 1.0)	A (± 0.9)	B (± 1.0)	K (± 0.5)	L (± 0.1)	M (j6)	N (± 1.0)	P (± 0.31)	R (H14)	S (± 0.4)	T (± 0.7)	
115B	193.8	154.0	230.9	191.1									
115C	223.8	184.0	260.9	221.1	13.2	2.70	110.0	156.5	116.0	10.00	130.0	115.0	M8
115D	253.8	214.0	290.9	251.1									

	Feedback FB, EB/CA/SA, RA		Feedback AE	
	Unbraked length	Braked length	Unbraked length	Braked length
	A (± 0.9)	A (± 0.9)	A (± 0.9)	A (± 0.9)
115B	206.8	243.9	183.8	220.9
115C	236.8	273.9	213.8	250.9
115D	266.8	303.9	243.8	280.9

Shaft dimensions (mm)

	Shaft diameter	Shaft length	Key height	Key length	Key to shaft end	Key width	Tapped hole thread size	Tapped hole depth
	C (j6)	D (± 0.45)	E (IEC 72-1)	F (± 0.25)	G (± 1.1)	H (h9)	I	J (± 0.1)
24.0 Std	24.0	50.0	27.0	40.0	5.3	8.0	M8 x 1.25	20.0

3.4.4 Frame size 142 For 3 Phase VPWM drives

Motor frame size (mm)	142ED			142UD		
Voltage (Vrms)	200-240			380-480		
Frame length	C	D	E	C	D	E
Continuous Stall Torque (Nm)	25.0	31.5	38.0	25.0	31.5	38.0
Peak Torque (Nm)	74.9	94.5	114.0	74.9	94.5	114.0
Inertia (kgcm²)	17.0	22.1	27.2	17.0	22.1	27.2
Winding thermal time constant (s)	245.0	251.0	256.0	245.0	251.0	256.0
Motor weight unbraked (kg)	11.5	15.0	18.5	11.5	15.0	18.5
Motor weight braked (kg)	14.3	17.8	21.3	14.3	17.8	21.3
Number of poles	10	10	10	10	10	10
Speed 1000 (rpm) Kt (Nm/A) =	2.8					
Ke (V/krpm) =	171.0					
Rated torque (Nm)	23.3	29.0	34.5			
Stall current (A)	8.9	11.2	13.6			
Rated power (kW)	2.44	3.04	3.61			
R (ph-ph) (Ω)	1.36	0.94	0.72			
L (ph-ph) (mH)	21.34	15.17	12.30			
Connection type	B	B	B			
Speed 1500 (rpm) Kt (Nm/A) =				3.2		
Ke (V/krpm) =				196.0		
Rated torque (Nm)				22.3	27.0	31.7
Stall current (A)				7.8	9.8	11.9
Rated power (kW)				3.5	4.2	5.0
R (ph-ph) (Ω)				1.36	0.94	0.72
L (ph-ph) (mH)				21.34	15.17	12.30
Connection type				B	B	B
Speed 2000 (rpm) Kt (Nm/A) =	1.4			2.4		
Ke (V/krpm) =	85.5			147.0		
Rated torque (Nm)	21.4	25.7	29.6	21.4	25.7	29.6
Stall current (A)	17.8	22.5	27.1	10.4	13.1	15.8
Rated power (kW)	4.48	5.38	6.20	4.48	5.38	6.20
R (ph-ph) (Ω)	0.34	0.24	0.18	0.79	0.62	0.49
L (ph-ph) (mH)	5.33	3.79	3.07	12.15	9.66	8.34
Connection type	J	J	J	B	B	B
Speed 3000 (rpm) Kt (Nm/A) =	0.93			1.6		
Ke (V/krpm) =	57.0			98.0		
Rated torque (Nm)	18.4	20.9	C/D	18.4	20.9	23.0
Stall current (A)	26.9	33.9		15.6	19.7	23.8
Rated power (kW)	5.78	6.57		5.78	6.57	7.23
R (ph-ph) (Ω)	0.12	0.10		0.34	0.24	0.18
L (ph-ph) (mH)	1.90	1.57		5.33	3.79	3.07
Connection type	J	J	J	B	J	J

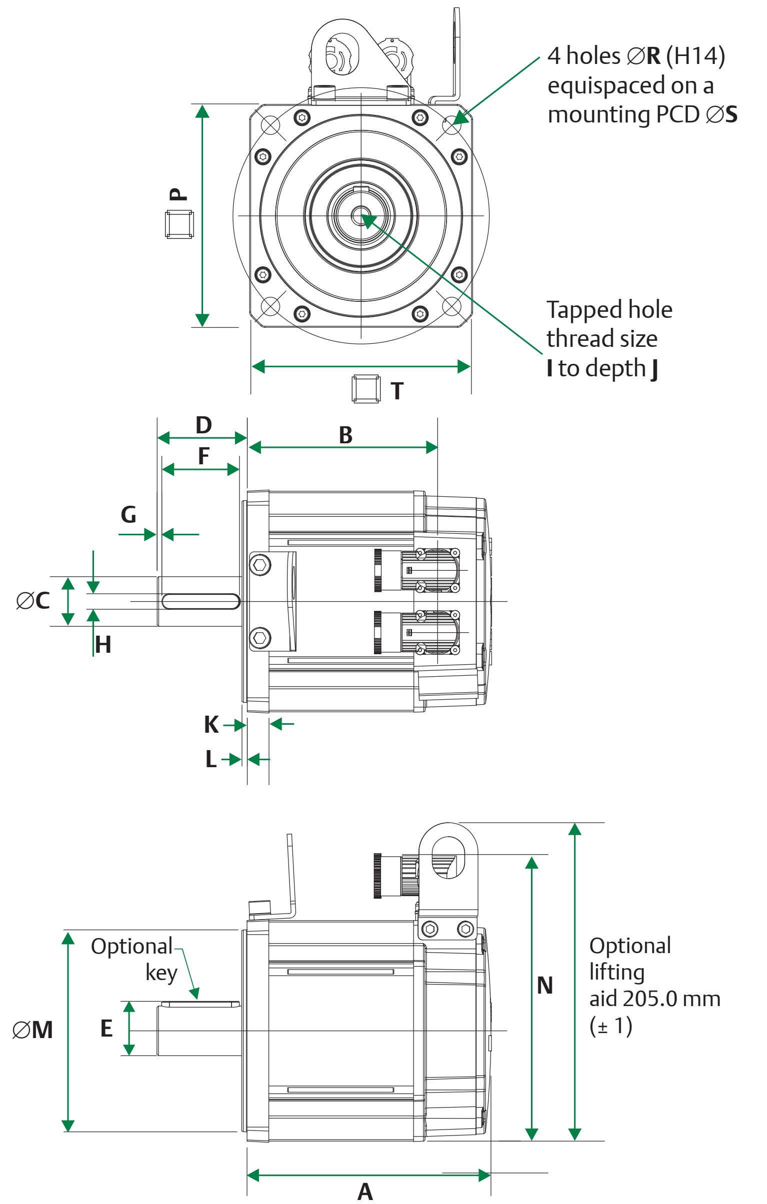
Δt= 100°C winding 40°C maximum ambient

All data subject to +/-10% tolerance

Stall torque, rated torque and power relate to maximum continuous operation tested in a 20°C ambient at 12kHz drive switching frequency

All other figures relate to a 20°C motor temperature.

Maximum intermittent winding temperature is 140°C



Motor dimension (mm)

Drawingnumber:IM/0709/GA

	Unbraked length		Braked length		Flange thickness	Register length	Register diameter	Overall height	Flange square	Fixing hole diameter	Fixing hole PCD	Motor housing	Mounting bolts
	A (± 0.9)	B (± 1.0)	A (± 0.9)	B (± 1.0)	K (± 0.2)	L (± 0.1)	M (j6)	N (± 1.0)	P (± 0.31)	R (H14)	S (± 0.4)	T (± 0.7)	
142C	217.0	182.5	282.5	248.0				183.5					
142D	247.0	212.5	312.5	278.0	14.0	3.4	130.0	183.5-204.5	142.0	12.0	165.0	142.0	M10
142E	277.0	242.5	342.5	308.0				183.5-204.5					

Shaft dimensions (mm)

	Shaft diameter	Shaft length	Key height	Key length	Key to shaft end	Key width	Tapped hole thread size	Tapped hole depth
	C (k6)	D (± 0.45)	E (IEC 72-1)	F (± 0.25)	G (± 1.5)	H (h9)	I	J (± 1.0)
32.0 Std	32.0	58.0	35.0	50.0	3.0	10.0	M12 x 1.75	29.0

3.4.5 Frame size 190 For 3 Phase VPWM drives

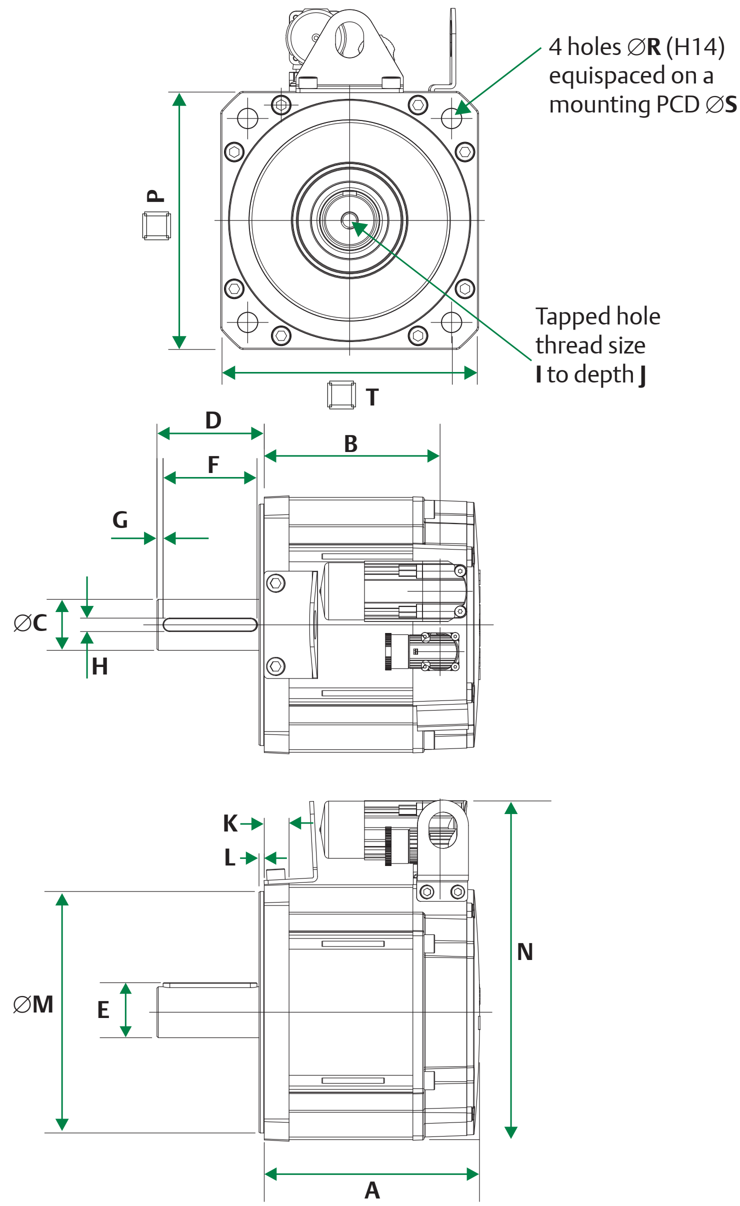
Motor frame size (mm)	190ED			190UD		
Voltage (Vrms)	200-240			380-480		
Frame length	C	D	F	C	D	F
Continuous Stall Torque (Nm)	52.0	62.0	85.0	52.0	62.0	85.0
Peak Torque (Nm)	156.0	186.0	255.0	156.0	186.0	255.0
Inertia (kgcm²)	54.6	70.9	103.5	54.6	70.9	103.5
Winding thermal time constant (s)	311.0	316.0	324.0	311.0	316.0	324.0
Motor weight unbraked (kg)	23.5	28.6	38.8	23.5	28.6	38.8
Motor weight braked (kg)	28.8	33.9	44.1	28.8	33.9	44.1
Number of poles	10	10	10	10	10	10
Speed 1000 (rpm) Kt (Nm/A) =	2.8					
Speed 1000 (rpm) Ke (V/krpm) =	171.0					
Rated torque (Nm)	49.0	56.5	77.5			
Stall current (A)	18.6	22.1	30.4			
Rated power (kW)	5.13	5.92	8.12			
R (ph-ph) (Ω)	0.47	0.40	0.23			
L (ph-ph) (mH)	12.30	10.40	6.79			
Speed 1500 (rpm) Kt (Nm/A) =				3.2		
Speed 1500 (rpm) Ke (V/krpm) =				196.0		
Rated torque (Nm)				46.2	52.2	68.5
Stall current (A)				16.3	19.4	26.6
Rated power (kW)				7.26	8.20	10.76
R (ph-ph) (Ω)				0.55	0.38	0.23
L (ph-ph) (mH)				14.15	10.40	6.79
Speed 2000 (rpm) Kt (Nm/A) =	1.4			2.4		
Speed 2000 (rpm) Ke (V/krpm) =	85.5			147.0		
Rated torque (Nm)	42.5			42.5		
Stall current (A)	37.1			21.7		
Rated power (kW)	8.90			8.90		
R (ph-ph) (Ω)	0.12			0.32		
L (ph-ph) (mH)	3.07			8.20		

Δt= 100°C winding 40°C maximum ambient
All data subject to +/-10% tolerance

Stall torque, rated torque and power relate to maximum continuous operation tested in a 20°C ambient at 6kHz drive switching frequency

All other figures relate to a 20°C motor temperature.

Maximum intermittent winding temperature is 140°C



Motor dimension (mm)

Drawingnumber:IM/00710/GA

	Unbraked length		Braked length		Flange thickness	Register length	Register diameter	Overall height	Flange square	Fixing hole diameter	Fixing hole PCD	Motor housing	Mounting bolts
	A (± 0.9)	B (± 1.0)	A (± 0.9)	B (± 1.0)	K (± 0.2)	L (± 0.1)	M (j6)	N (± 1.0)	P (± 0.31)	R (H14)	S (± 0.4)	T (± 0.7)	
190C	220.6	191.1	319.1	289.6	18.5	3.9	180.0	252.5	190.3	14.5	215.0	190.0	M12
190D	250.6	221.1	349.1	319.6									
190F	310.6	251.1	409.1	379.6									

Shaft dimensions (mm)

	Shaft diameter	Shaft length	Key height	Key length	Key to shaft end	Key width	Tapped hole thread size	Tapped hole depth
	C (k6)	D (± 0.45)	E (IEC 72-1)	F (± 0.25)	G (± 1.5)	H (h9)	I	J (± 1.0)
38.0 Std	38.0	80.0	41.0	70.0	4.6	10.0	M12 x 1.75	29.0

4 Generic information

4.1 Performance definitions

Stall torque

This is the maximum torque within the continuous zone at zero speed.

Maximum continuous torque ratings may be intermittently exceeded for short periods provided that the winding Δt max temperature is not exceeded.

Δt max = 100°C over a maximum ambient of 40°C for Unimotor fm.

Stall current

Stall current = Stall torque / kt

Motor label and performance tables quote stall current when motor is at full power in a maximum ambient of 40°C.

Rated speed

This is the maximum speed of the motor within the continuous zone. The motor speed can be controlled to any speed subject to the voltage limits and drive constraints as shown by the intermittent zone on the graph (see speed limits).

Ke voltage constant

This is the phase to phase rms voltage generated at the stator when the shaft is back driven at 1000rpm with the rotor at 20°C.

Kt torque constant

A brushless motor delivers torque proportional to the current, such that torque = kt x current.

Where kt = 0.0165 x ke (at 20°C).

Magnets used on all motors are affected by temperature such that ke and kt reduce with increasing temperatures of the magnets. The reductions depends upon the magnet type and material grade used.

Winding thermal time constant

The thermal time constant of the winding with respect to the stator temperature as a reference in the exponential temperature rise given by the formulae:-

Winding temperature at time **t** seconds = **T0+T1(1-e-t/tc)**

Where **T0** is the initial temperature,**T1** is the final winding temperature and tc = thermal time constant (seconds)

Note that temperature = 63.2% of **T1** when **t=tc**

A thermal protection trip is provided by the drive, based upon calculations using elapsed time, current measurement, and the parameter settings set by the user or directly from the motor map.

Unimotor fm's windings are ultimately protected by thermistor devices in the winding overhangs. These must be connected to the appropriate drive inputs via the motor feedback signal connector.

Rated power

This is the product of the rated speed (radian/sec) and the rated torque (Nm) expressed in Watts (W).

Δt temperature

Δt temperature is the temperature difference between the copper wires of the motor winding and the ambient air temperature surrounding the motor.

The maximum Δt temperature permitted is 100°C over a maximum ambient of 40°C.
(i.e. a maximum winding temperature of 140°C)

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4.2 Motor selection

Motor derating

Any adverse operating conditions require that the motor performance be derated. These conditions include; ambient temperature above 40°C, motor mounting position, drive switching frequency or the drive being oversized for the motor.

Ambient temperatures

The ambient temperature around the motor must be taken into account. For ambient temperatures above 40°C the torque must be derated using the following formula as a guideline. (Note: Only applies to 2000/3000rpm motors and assumes copper losses dominate)

New derated torque = Specified torque x $\sqrt{}$ [1-((Ambient temperature - 40°C) / 100)]

For example with an ambient temperature of 76°C the new derated torque will be 0.8 x specified torque.

Mounting arrangements

The motor torque must be derated if the motor mounting surface is heated from an external source, such as a gearbox. The motor is connected to a poor thermal conductor. The motor is mounted with the connectors on the side or vertical. The motor is in a confined space with restricted air flow.

Drive switching frequency

Most Digitax ST / Unidrive SP nominal current ratings are reduced for the higher switching frequencies see Digitax ST or Unidrive SP manual for details.

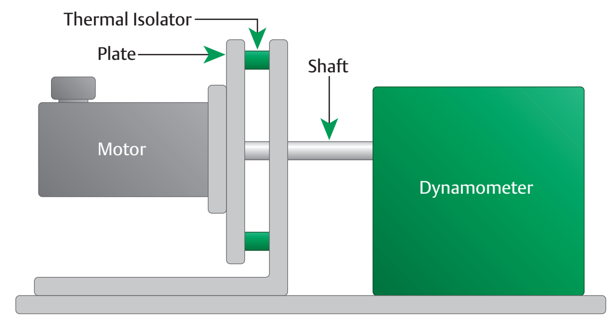
See the table below for the motor de rate factors. These figures are for guidance only.

(Note: Only applies to motors up to 3000rpm and assumes copper losses dominate)

Switching frequency	Motor type/frame					
	055	067	089	115	142	190
3kHz	0.92	0.93	0.89	0.89	0.83	0.90
4kHz	0.93	0.94	0.91	0.92	0.85	0.95
6kHz	0.95	0.95	0.95	0.96	0.88	1
8kHz	0.96	0.98	0.97	0.98	0.91	1
12/16kHz	1	1	1	1	1	1

Thermal test conditions

The performance data shown has been recorded under the following conditions. Ambient temperature 20°C, with the motor mounted on a thermally isolated aluminum plate as shown below.



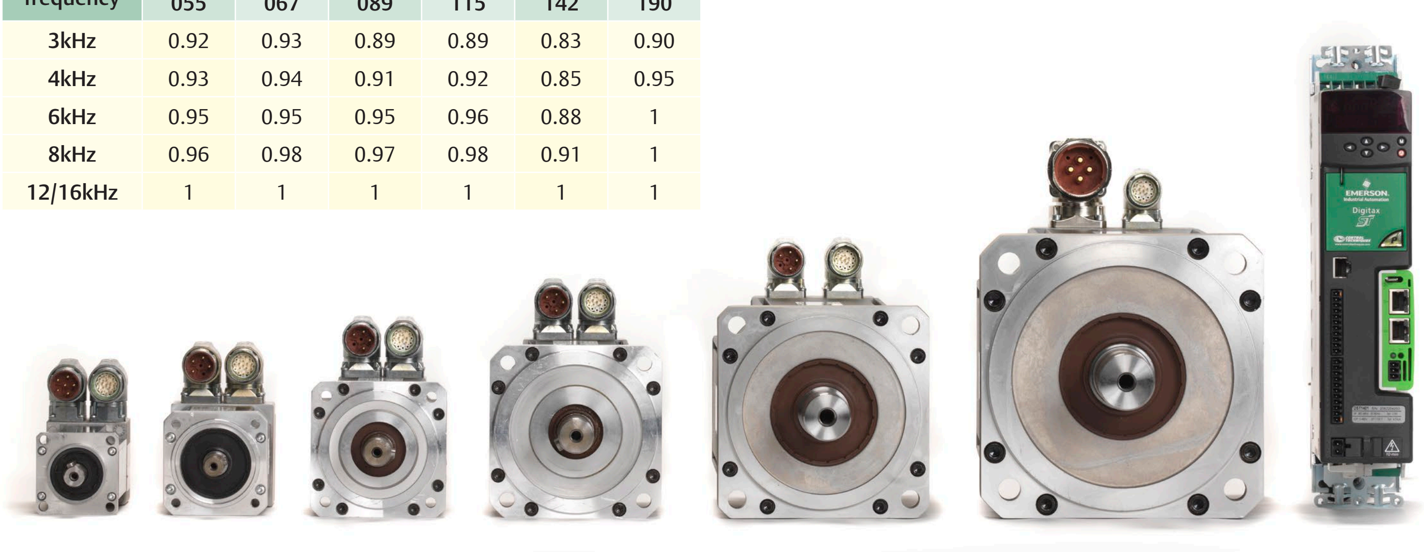
Motor type/frame	Aluminium heatsink plate
055mm	110 x 110 x 27mm
067-089mm	250 x 250 x 15mm
115-142mm	350 x 350 x 20mm
190mm	500 x 500 x 20mm

Thermal protection

Thermistor protection (145°C) is built into the motor windings and gives an indication of serious overheating problems. The installer must connect the thermistor to the drive, failure to do so will invalidate the motor warranty in respect of a burnt out winding.

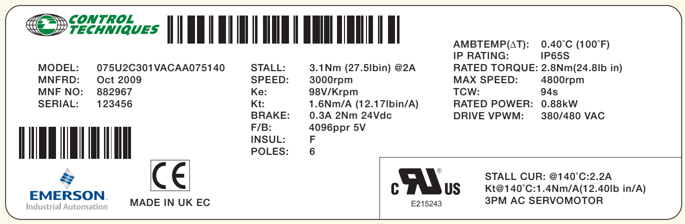
Environmental conditions

Any liquids or gases that may come into contact with the motor must be confirmed to ensure compliance with the correct international standards.



4.3 Nameplate

4.3.1 Unimotor fm



Model	This is the full part number of the fm motor.
MNFRD	This is the date that the motor was manufactured.
MNF NO	This is the works order for the motor.
SERIAL	This is the serial number of the motor.
STALL	This is the full motor stall torque at the stall current.
SPEED	This is the rated speed of the motor.
Ke	This is the AC volts per 1000rpm with the motor at 20°C.
Kt	Value shown is for the motor magnet temperature at 20°C.
BRAKE	This gives the current, the rated torque and the operating voltage if the brake is fitted. N/A if the brake is not fitted.
F/B	This gives the feedback device count and working voltage, or the feedback type.
INSUL	Winding are built to class F standard (155°C).
POLES	Number of poles: ➜ 075 to 142 have 6 poles = 3 pole pairs ➜ 055 and 190 have 8 poles = 4 pole pairs ➜ 250 have 10 poles = 5 pole pairs
AMBTEMP (ΔT)	This is the ambient temperature range / (delta) winding temperature increase above ambient (at full rating).

IP RATING	Ingress protection rating = IP65S (excludes the front shaft seal).
RATED TORQUE	This is the continuous torque at full rated speed.
MAX SPEED	The max speed shown will be the lowest one of these three factors: 1. Maximum drive voltage. 2. Maximum encoder speed. 3. Maximum mechanical speed. The max speed is not to be considered for field weakening.
TCW	This is the thermal time constant of the windings with respect to the stator temperature.
RATED POWER	This is the rated power of the motor.
DRIVE VPWM	This indicates that the motor is for use with a Voltage Pulse Width Modulation drive with a supply voltage as shown.
CE	CE (Conformite Europeenne) mark. A declaration of incorporation is contained within the Unimotor fm Installation Guide that accompanies each motor.
c US	The UL symbol together with the "E215243" file number indicates full motor recognition by Underwriters Laboratory (UL) in USA and by Canadian Standards Authority (CSA) in Canada.

4.3.2 Unimotor hd

F/B	The feedback device count and working voltage or the feedback type.
MNF NO	The CTD works order for the motor.
SN/MNFRD	The serial number / the date that the motor was manufactured.
IP65	Motor index of protection.
MCS	The Constant Stall Torque @ the Stall current.
MN	The Rated Torque.
Ke	This is the AC Volts per 1000rpm with the motor at 20˚C.
Kt	Value shown is for the motor magnet temperature at 20˚C.

ICS	The Constant stall current at the maximum winding temperature of 140˚C.
PN	The rated power.
nN /max	The rated speed / This is the maximum speed allowed when taking into account these three factors:- 1) Maximum drive voltage. 2) Maximum encoder speed. 3) Maximum mechanical speed.
DRIVE	This indicates that the motor is for use with a Voltage Pulse Width Modulated drive with the supply voltage shown.
BRAKE	The current, the rated torque and the operation voltage for the brake or N/A if the brake is not fitted.

4.4 Motor selection

A reliable servo system depends upon the initial system design and correct selection of the motor, feedback, gearbox and drive. To ensure success careful attention should be paid to the following points:

- Speed, acceleration and inertia
- Peak and rms torque
- Motor feedback type
- Gear ratios
- Drive system operational mode
- Thermal effects
- Environmental conditions
- Mechanical restrictions
- Cost of motor-drive combination

It is necessary to estimate the root mean square (rms) torque value of the load. Where the motor has varying duty cycles it may be necessary to consider the worst case only.

Never exceed the maximum peak torque ratings.

Calculate the rms load torque at the motor and ensure that this is less than the motor rated torque. An additional allowance should be made on the load for inefficiencies and tolerance.

Choose a suitable motor within the size limitations of the installation. The frame size and motor speed may be selected using the performance data. Look for the rated torque at the appropriate temperature.

4.5 Checklist of operating details

Complete this checklist to help select which Unimotor fm best suits your application requirements.

Torque speed

- What motor operating speed do you require (rpm)?
  - 500
  - 1000
  - 2000
  - 3000
  - 4000
  - 6000
  - Other (non standard speed)
- What is the rms torque?
  Decide on switching frequencies for the drive, and derate motor or drive accordingly
- If the ambient temperature is above 40°C, apply a derating factor. If the motor is mounted to a hot interface; or interfaced with a low thermal mass; or high thermal resistance; apply a derating factor. Torque ratings of motors are stated in controlled conditions mounted on a reference front plate. Details can be found in the *Performance data* selection
- Inertia mismatch (ratio of the motor inertia to load inertia reflected to motor shaft) can be as high as 3:1 for acceleration rates of 1000 rad/s² for a typical system. Larger mismatches or acceleration can be tolerated with a rigid mechanical system and high resolution feedback
- Do you require a brake?

Motor mounting

- Does the motor fit the machine?
  Make allowances for cables and connections.
- Do you require an output key?
  - Output key
  - Plain shaft

  NB. When a gearbox is fitted, this choice applies to the gearbox o/p shaft, as supplied by Control Techniques Dynamics.

Feedback

- Do you want an encoder or resolver?
  - Incremental
  - SinCos Multi turn
    - SICK Hiperface
    - Heidenhain EnDat
    - Inductive absolute
    - High accuracy
  - SinCos Single turn
    - SICK Hiperface
    - Heidenhain EnDat
    - Inductive
    - High accuracy
  - Resolver

Electrical connections

- Connectors
  - Power and Signal 90° fixed
  - Power and Signal 90° rotatable
  - Power 90° rotatable and Signal vertical
  - Power and Signal vertical

Other options

- Do you require a gearbox?
  - Yes
  - No
- Many other customer special motors are made by Control Techniques Dynamics Limited.
  For further details, contact us.

4.6 Points to consider

Torque and temperature

- The maximum allowable temperature of the motor windings or feedback device should not be exceeded. The windings have a thermal time constant ranging from 90 seconds to over an hour. Dependent upon motor temperature the motor can be overdriven for shorter periods without exceeding the temperature limitations. The motor winding thermal time constant should be set-up in the drive; this parameter is used for thermal shock (I^2t) calculations within the drive
- The motor winding thermal time constant should be large in comparison with the medium term periods of high rms torque
- Ensure that the drive's features, such as switching frequency, waveforms, peak and continuous currents are suitable for the application. Low switching frequencies of the drive will require motor derating
- Torque estimates should include friction and acceleration (and hence inertia) calculations
- Consider the motor cooling effects; for example, is the conductive thermal path adequate? Is the motor mounted on a gearbox or heat source?
- Ensure that the motor and drive can meet the short term peak torque requirements

Braking

- The installation may require static parking brake

Inertia

- Ensure that the motor has correct inertia matching to suit the acceleration requirements. Consider inertia load matching especially for acceleration levels above 1000 rad/s². Motors with larger frame diameters have higher inertia. Higher inertia rotor options are available

Environmental conditions

- Other environmental factors, such as vibration, pressure, shock,heat and hazardous zones should be considered

Cables

- The cable lengths required for the installation should be considered. For maximum cable length, see *Maximum cable length* in the *Cable* section. Compliance with both Safety and EMC regulations should be ensured
- Ensure motor is mounted firmly and properly earthed. Screen all cables to reduce system noise and EMC

Feedback

- To achieve an efficient system it is necessary to ensure stiff mechanical connections and couplings to all rotating parts, so that a high servo bandwidth can be achieved. This will improve stability and enable higher servo gains to be set, ensuring higher accuracy and positional repeatability
- High resolution feedbacks will increase stability and allow greater acceleration or inertia mismatch

Bearing loads

- Check the radial and axial loadings are within the limits of the motor

4.7 Special motor requests

Control Techniques Dynamics offer many "special" motors. These motors are designed to meet a specific customer's requirements.

Special motors are denoted by a code on the end of the part number. S*** 3 or 4 digits; e.g. 115U2E100BACAA115240-SON (special coating)

To request a "special" motor please contact CTDynamics Technical Support with the customer requirements. A product enquiry form will be raised and R&D/Engineering will investigate the feasibility of the request. If acceptable then a "special" part number reference will be allocated to the motor and a quote will be issued.

Once an order is placed a Product Approval Schedule (PAS) form will be raised and sent to the Drive Centre for approval.

Special motors can include:

- Special paint finishes or unpainted motors
- Special motors with customer specific connector wiring
- Special motors with customer specific brakes
- Special motors with customer specific shaft dimension
- Special motors for harsh environments motors

4.8 Calculating load torque

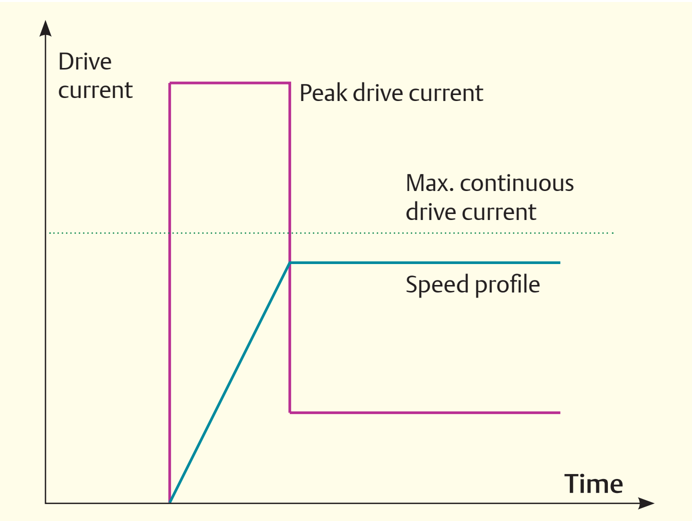
In any application, the load consists of various torque loads plus acceleration and decelerations of inertia.

Constant torque periods

Periods where a torque is maintained at constant or near constant motor speeds.

Acceleration and deceleration

Torque is required to achieve acceleration and deceleration. Acceleration times of less than one second can often be achieved using peak torque capability of the drive and motor.



Note

Peak drive current may be set by drive control to the motors continuous current rating. If this is required, check that it is within the drives capability. Medium periods of up to 200% over current are often acceptable for the motor, provided that the heating effects are not too rapid and that the motor thermal time constant is long in comparison.

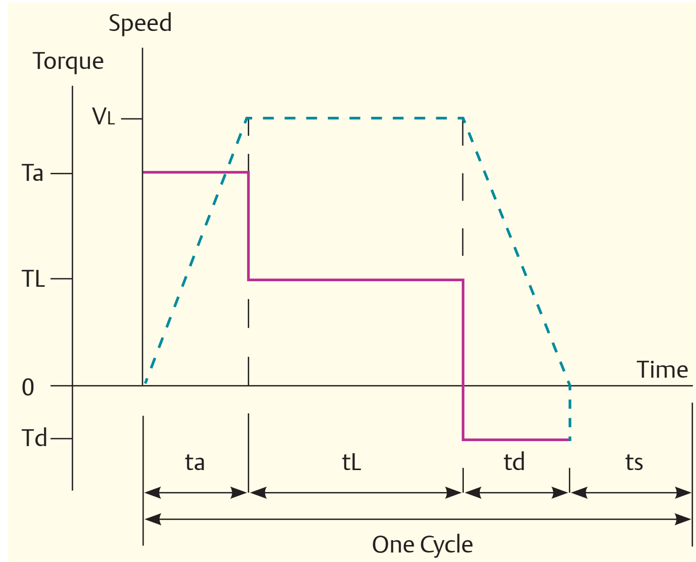
Inertia formula and accelerating or decelerating torques:

Inertial loads on a common shaft may be added together. Inertial loads may be reflected from the output of a reduction gearbox to the motor by dividing the output ratio by the square of the ratio.

Total inertia = reflected inertial load at motor + motor inertia

rms torque for a repetitive duty cycle:

Draw a graph of torque (T) against time for one complete repetitive cycle of events (or choose the worst case of various events). Make the torque axis vertical. On the same graph, draw the speed profile against time for one cycle.



From the above speed-torque diagram calculate the rms torque using the formula:

$$\mathbf{Trms} = \sqrt{\frac{\mathbf{Ta^2 \times ta + TL^2 \times tL + Td^2 \times td \times Ts^2 \times ts}}{\mathbf{ta + tL + td + ts}}}$$

Where:

Ta = Acceleration Torque (Nm)
TL = Load torque (Nm)
Td = Deceleration torque (Nm)
ta = Acceleration Time (s)
Ts = Dwell torque (Nm=0)
tL = On load running time (s)
td = Deceleration time (s)
ts = Dwell time (s)
VL = Full load speed (rpm)

Example

In an application where the torque speed profile is as above with **Ta** = 20Nm, **TL** = 5Nm, **Td** = -10Nm, **ta** = 20ms, **tL** = 5s, **td** = 30ms, **ts** = 3s, **VL** = 3000rpm, **Ts** = 0
calculate the rms torque for this application.

$$\mathbf{Trms} = \sqrt{\frac{\mathbf{20^2 \times 0.02 + 5^2 \times 5 + 10^2 \times 0.03 \times 0^2 \times 3}}{\mathbf{0.02 + 5 + 0.03 + 3}}}$$

$$\mathbf{Trms} = \sqrt{\frac{\mathbf{136}}{\mathbf{8.05}}}$$

Trms = 4.11Nm

15% tolerance required hence the rms torque for this application = **4.73Nm**

4.9 Understanding motor heating effects

During operation, the motor is subjected to heating effects from several sources. Some of these are obvious; others obscure. Whilst the motor specification allows for most of these heating effects, others depend on the application. This section examines some of the causes of motor heating.

Motor copper losses

Motor copper loss is a product of the rms current squared and the resistance of the motor windings. It includes ripple currents, determined by the switching frequency of the drive and the inductance of the motor. The inductance of the winding is generally low, so that the maximum drive frequencies should be selected commensurate with drive heating losses. Data in this manual is for switching frequencies as stated in the performance data section. If lower frequencies are used, motor performance is reduced.

Motor copper loss also includes losses arising from waveform distortions of either the drive or motor or both. The motor's back EMF waveform is sinusoidal and of low harmonic distortion. If lower frequencies are used, the drive current has higher distortion and hence the motor performance is reduced.

Motor current depends on the torque demanded by the load at any instant. This is normally given by the motor torque constant (Kt) in Nm/A. Although regarded as a constant, Kt decreases slightly when the motor is at maximum temperature.

The Ke for a brushless three phase motor is always quoted Volts(rms) per Krpm, since the motor back emf is sinusoidal.

Motor iron losses

Motor iron loss is a heating effect produced in the motor laminations. It is caused by the rotating magnetic field cutting through the laminations, the higher the speed the higher the losses. For this reason the motor stall torque is greater than the motor rated torque at speed.

Iron loss depends on the strength of the magnetic field and type of laminations material.

Friction and windage

The bearings, oil seals and the air resistance to rotor speed cause internal friction. Its effect is relatively small and is included in the data provided.

Thermal protection

An incorrect system set up can give rise to excessive motor temperatures. This can be guarded against by the use of the motor thermistor protection facility.

Servo motor/drive system faults

Common but often unnoticed causes of motor overheating can be created by:

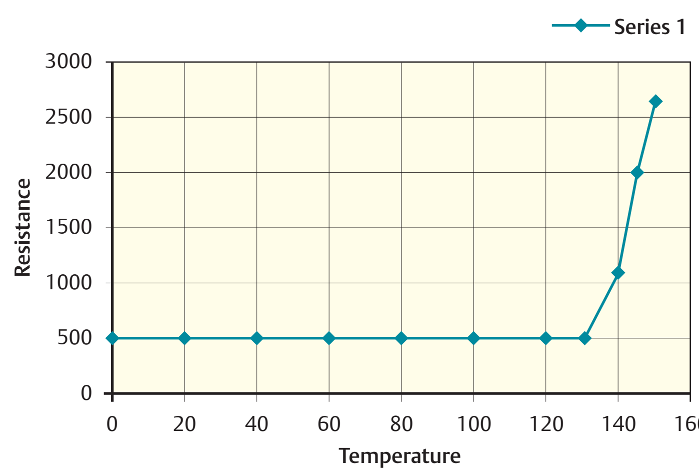
- Instability (self induced oscillation) within the overall servo feedback system
- Incorrect parameter settings in the drive protection system, for example peak current, and I^2t (thermal protection calculation for the drive)

Thermistor protection

A PTC thermistor rated to 145˚C, is built into the motor windings and is used to protect the motor against overheating problems.

The device remains a low resistance until a critical temperature is reached, where it will then switch to a very high resistance. The increase in resistance is measured by the drive and a "th trip" will occur. Only once the motor has cooled can the trip be cleared.

Unimotor fm PTC 145°C



The installer must connect the motor thermistor to the drive to cause motor power shutdown in the event of overheating. It is the installer's responsibility to ensure that this protection facility is properly connected and set at the drive.
Failure to ensure the correct operation of the protection facility invalidates the warranty in respect of a burnt out winding.

Environment and torque derating

The ambient temperature of the environment into which the Unimotor fm is mounted must be considered.

4.10 Motor derating

Motor derating

Any adverse operating conditions require that the motor performance be derated. These conditions include; ambient temperature above 40°C, motor mounting position, drive switching frequency or the drive being oversized for the motor.

Ambient temperatures

The ambient temperature around the motor must be taken into account. For ambient temperatures above 40°C the torque must be derated using the following formula as a guideline. (Note: Only applies to 2000/3000rpm motors and assumes copper losses dominate.)

$$\text{New derated torque} = \text{Specified torque} \times \sqrt{[1-((\text{Ambient temperature} - 40^{\circ}\text{C}) / 100)]}$$

For example with an ambient temperature of 76°C the new derated torque will be 0.8 x specified torque.

Mounting arrangements

The motor torque must be derated if:

- The motor mounting surface is heated from an external source, such as a gearbox.
- The motor is connected to a poor thermal conductor.
- The motor is in a confined space with restricted air flow.

Drive switching frequency

Most Unidrive SP and Digitax ST nominal current ratings are reduced for the higher switching frequencies. See the appropriate drive manual for details.

See the table below for the motor derate factors.
These figures are for guidance only.

4.11 Motor derate factors

4.11.1 Unimotor fm

Switching frequency	Motor type/frame									
	055	075	095	115		142		190		250
	A-C	A-D	A-E	A-C	D-E	A-C	D-E	A-B	C-H	D-F
3kHz	0.92	0.93	0.88	0.89	0.84	0.87	0.81	0.98	N/A	0.88
4kHz	0.93	0.94	0.91	0.91	0.87	0.91	0.86	0.99	0.55	0.90
6kHz	0.95	0.95	0.93	0.93	0.90	0.94	0.89	0.99	0.77	0.94
8kHz	0.96	0.98	0.97	0.97	0.95	0.97	0.96	1	0.90	0.98
12/16kHz	1	1	1	1	1	1	1	1	1	1

Note

Only applies to motors up to 3000rpm (rms) for frame sizes 055 to 190 and 1500rpm (rms) for frame size 250. Assumes copper losses dominate on all frame sizes.

Derate factor is applied to stall torque, rated torque, stall current and rated power.

4.11.2 Unimotor hd

Switching frequency	Motor type/frame					
	055	067	089	115	142	190
3kHz	0.92	0.93	0.89	0.89	0.83	0.90
4kHz	0.93	0.94	0.91	0.92	0.85	0.95
6kHz	0.95	0.95	0.95	0.96	0.88	1
8kHz	0.96	0.98	0.97	0.98	0.91	1
12/16kHz	1	1	1	1	1	1

Note

Only applies to motors up to 3000rpm (rms) and assumes copper losses dominate.

4.12 Feedback selection

Feedback device part number code	Feedback type	Manufacturer	Encoder supply voltage[1]	SinCos cycles or incremental pulses per revolution	Resolution available to position loop[2&3]	Multi -turn option[1]	Other information[1]	Feedback accuracy[1]	Vibration[1]	Shock Limit[1]
AE	Resolver	API Harrowe	6Vdc rms Excitation 6kHz	1	Medium 16384 (14 bit)	No	Transformation ratio 0.31 Resolver rotor winding 2 pole	Low ±720”	High (not stated by supplier)	High (not stated by supplier)
CA MA KA	Incremental Encoder	SICK	5Vdc	4096 2048 1024	Medium 16384 (14 bit) 8192 (13 bit) 4096 (12 bit)	No	Quadrature tracks	High ±60”	Medium 20g (10 - 2000 Hz) (to BS EN 60068-2-6)	Medium 100g per 10ms (to BS EN 60068-2-27)
EC (Multi-turn) FC (Single turn)	Inductive absolute encoder	Heidenhain	7-10Vdc	32	Medium Absolute position 524288 (19 bits)	Yes 4096 revs (12 bits)	EnDat serial comms	Medium ±280”	Medium 10g (55-2000Hz) (to IEC60 068-2-6)	Medium 100g 6ms (to IEC60 068-2-27)
RA (Multi-turn) SA (Single turn)	SinCos optical encoder	SICK	7-12Vdc	1024	High 1.04x10^6 (20 bits)	Yes 4096 revs (12 bits)	Hiperface	High For sin/cos Integral non-linearity ±45” For sin/cos Differential nonlinearity ±7” (Total accuracy ±52”)	Medium 20g (10-2000 Hz) (to BS EN 60068-2-6)	Medium 100g per 10ms (to BS EN 60068-2-27)
EB (Multi-turn) FB (Single turn)	SinCos optical encoder	Heidenhain	3.6-14Vdc	2048	Very High 2.08x10^6 (21 bits)	Yes 4096 revs (12 bits)	EnDat Serial comms	Very High ±20” (Differential non linearity ±1% signal period)	Medium 15g (55-2000Hz) (to IEC60 068-2-6)	Medium 100g 6ms (to IEC 60 068-2-27)
AR	Resolver	LTN RE-15	7Vdc Excitation 5kHz	1	Medium 16384 (14 bit)	No	Transformation ratio 0,5 ±10 % Resolver rotor winding 2 pole	Low ±600”	High 50g (10 to 500 Hz)	Medium 100g (11ms)
KR MR CR	Incremental encoder	Renco R35i	5Vdc	1024 2048 4096	Medium 4096 (12 bit) 8192 (13 bit) 16384 (14 bit)	No		Medium ±150”	Medium 10g (200 to 2000 Hz)	Medium 50g (11ms)
EM (Multi-turn) FM (Single turn)	Inductive absolute encoder	Heidenhain EQI1130 ECI1118	5Vdc	16	Medium 2.62x10^5 (18 bits)	Yes 4096 revs (12 bits)	EnDat Serial comms	Medium ±480”	Medium 30g (55 to 2000 Hz) (EN 60 068-2-6)	Medium 100g (6ms) (EN 60 068-2-27)
TL (Multi-turn) UL (Single turn)	SinCos optical encoder	SICK SKM36 SKS36	7 - 12Vdc	128	Medium 1.31x10^5 (17 bit)	Yes 4096 revs (12 bits)	Hiperface	High ±52”	Medium 50 g (10 to 2000 Hz) (EN 60 068-2-6)	Medium 100 g (6ms) (EN 60 068-2-27)
TM (Multi-turn) UM (Single turn)	SinCos optical encoder	Heidenhain EQN1125 ECN1113	3,6 - 14Vdc	512	Medium 5.24x10^5 (19bit)	Yes 4096 revs (12 bits)	EnDat Serial comms	HIgh ±60”	Medium 20g (55 to 2000 Hz) (EN 60068-2-6)	Medium 100g (6ms) (EN 60068-2-27)
LM (Multi-turn) NM (Single turn)	Inductive Absolute Encoder EnDat 2.2 (Serial comms only)	5Vdc	16	Medium 2.62x10^5 (18 bits)	Medium +/- 480”					
LC (Multi-turn) NC (Single turn)	Inductive Absolute Encoder EnDat 2.2 (Serial comms only)	7-10Vdc	32	Medium Absolute position 524288 (19 bits)	Medium +/- 280”					

[1] The information is supplied by the feedback device manufacturer and relates to it as a standalone device. The values may change when mounted into the motor and connected to a drive. These values have not been verified by Control Techniques Dynamics.

[2] The output from the resolver is an analogue output. The resolution is determined by the analogue to digitial converter used. The value shown is when the resolver is used in conjunction with the SM-Resolver.

[3] The sin and cosine outputs from the SinCos optical encoders are analogue outputs. With Unidrive SP and Digitax ST the resolutions quoted above are when the encoder type is set to either SC Endat or SC Hiper depending on the encoder.

4.13 Feedback terminology

Accuracy

Accuracy is the measure of the difference between the expected position and actual measured value. Rotary feedback accuracy is usually given as an angle representing the maximum deviation from the expected position. Linear feedback accuracy is usually given as a distance representing the maximum deviation from the expected. Generally, as accuracy increases the cost of the feedback device increases.

Absolute encoder

Absolute encoders output unique information for each mechanical measured position. With the motor shaft or plate in any position when the drive is turned on the feedback device will always be able to sense a unique position and transmit this value to the drive. For an absolute single turn rotary encoder these unique positions will be over one revolution.

When power is removed from the encoder and the shaft or plate moves the device will know its current position when the power is restored.

A non-absolute feedback mechanism must start from a known position, such as the index or marker pulse.

Bit

A bit is short for **B**inary Dig**it**. It is the smallest unit of information in a machine/drive. A single bit has a binary value of either 0 or 1. These bits do not normally exist on their own, but usually in groups. The larger the number of bits in a group the larger the amount of information that is available and thus the higher the resolution. This group can be converted to decimal using binary arithmetic. The group of bits can be converted to decimal by starting at the right most bit and multiplying each successive bit to the left by two. So for example a 12 bit number would give a decimal equivalent of 4,096 and a 19 bit number would give a decimal equivalent of 524,288.

Commutation

All brushless AC permanent magnet motors require commutation information to enable the drive to synchronise the stator flux field with the rotor of the motor.

To ensure optimum torque at all rotor positions both when stationary and at speed the drive is required to maintain motor current in phase with the peak of the motor's sinusoidal waveform. The drive must therefore know the position of the rotor with respect to the stator at all times.

Commutation phase offset

Most drives, including the Unidrive SP, provide a "Phase Offset" adjustment as a means of correctly setting the commutation position.

For feedback devices that are not aligned, the Unidrive SP has an Encoder Phasing Test (Autotune) (Pr **5.12**) that automatically creates a Phase Offset value (Encoder phase angle) (Pr **3.25**).

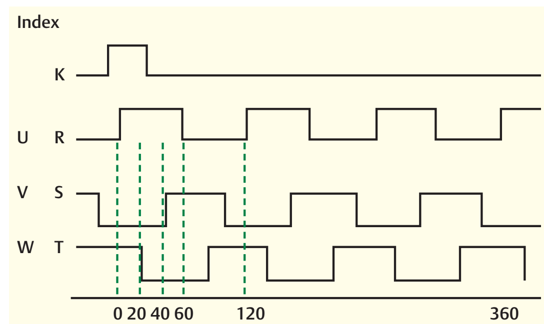
All FM motor feedback devices are set to match the Unidrive SP definition of zero phase offset, so that the drive may operate with zero phase offset adjustment, thus allowing interchange of motors between drives without further adjustment.

Note that not all drives have the same zero offset definition.

Commutation outputs

Commutation outputs are used on devices that are non-absolute. For AC Synchronous 3 phase motors there are 3 commutation output signal channels from the feedback device, for example S1, S2 and S3.

The diagram below shows commutation outputs for 6 pole commutation (3 pole pairs). The 3 phase motor sinusoidal power from the drive runs synchronously with motor speed at N/2 cycles per revolution;



Where N = number of poles. For example a 6 pole motor the encoder commutation tracks will output 3 pulses per channel per revolution and for an 8 pole motor the encoder commutation tracks will give 4 pulses per channel per revolution.

The commutation signals allow the drive to operate the motor at 'switch on' with only a small possible reduction in efficiency and torque in the motor. The best way to explain this is to use an example where an encoder is connected to a motor with 6 poles.

On power up the drive would look at the S1, S2 and S3 signals to determine where the stator is relative to the rotor or magnetic plate. This would give a known position that is within 60° electrical of an electrical cycle (20° mechanical). During this initial period, the drive assumes that it is in the middle of this 60° unknown region. So the worse case error of this is 30° electrical (10° mechanical), which equates to a drop of 13.4% in the rated torque when 100% current is delivered into the motor winding. When the drive is commanded to move the motor position, the stator is energized causing the plate or rotor to move. While the rotor or plate is moving, the drive detects that a signal switch (edge detection) has occurred on one of the commutation channels (S1, S2 or S3). At this point the drive knows exactly where it is in the electrical cycle and adjusts the field orientation to compensate for the error. At this point the drive switches over to using only the incremental signals for commutation and the commutation channels are no longer used.

Electronic nameplate

Available on some feedback devices the electronic nameplate provides the facility to electronically store information about the motor and feedback device. This information can then automatically be used to configure the drive for operation.

Environment	The environment is the external conditions that physically surround the Feedback device. The main factors that affect the feedback device are temperature and mechanical shock and vibration. Motors are designed to allow the feedback devices to be within their operational temperature limits. Generally it is assumed that there is free air movement around the motor. If the motor is positioned where there is little or no airflow or it is connected to a heat source such as a gearbox. This can cause the air temperature around the feedback device to be operating outside its recommended operating temperature and can lead to problems. Mechanical shock and vibration tends to be transmitted from the load, through the motor shaft and into the feedback device. This should be considered when the motor and feedback device are being specified for the application.
Position	The defined position is the location in a coordinate system which is usually in two or more dimensions. For a rotary feedback device this is defined as the location within one revolution. If it is a multi-turn device it is the location within one revolution plus the location within a number of rotations. For a linear feedback device this is defined as the distance from a known point.
Resolution	The resolution of a feedback device is the smallest change in position or angle that it can detect in the quantity that it is measuring. Feedback resolution of the system is a function of the type of feedback device used and drive receiving the information. Generally, as the resolution of the feedback device increases the level of control that can be used in the servo system increases. As with accuracy, as the resolution of the device increases the cost increases.
Resolver	A passive wound device consisting of a stator and rotor elements excited from an external source, such as an SM-Resolver, the resolver produces two output signals that correspond to the sine and cosine angle of the motor shaft. This is a robust absolute device of low accuracy, capable of withstanding high temperature and high levels of vibration. Positional information is absolute within one turn - i.e. position is not lost when the drive is powered down.
Incremental encoder	An electronic device using an optical disc. The position is determined by counting steps or pulses. Two sequences of pulses in quadrature are used so the direction sensing may be determined and 4 x (pulses per rev) may be used for resolution in the drive. A marker pulse occurs once per revolution and is used to zero the position count. The encoder also provides commutation signals, which are required to determine the absolute position during the motor phasing test. This device is available in 4096, 2048 and 1024 ppr version. Positional information is non absolute - i.e. position is lost when the drive is powered down.
SinCos/ Absolute Encoders	Types available are: Optical or Inductive - which can be single or multi-turn.
1) Optical	An electronic device using an optical disc. An absolute encoder with high resolution that employs a combination of absolute information, transmitted via a serial link, and sine/cosine signals with incremental techniques.
2) Inductive	An electronic device using inductively coupled PCBs. An absolute encoder with medium resolution that employs a combination of absolute information, transmitted via a serial link, and sine/cosine signals with incremental techniques. This encoder can be operated with the drive using either sine/consine or absolute (serial) values only. Positional information is absolute within 4096 turns - i.e. position is not lost when the drive is powered down.
Multi-turn	As previous but with extra gear wheels included so that the output is unique for each shaft position and the encoder has the additional ability to count complete turns of the motor shaft up to 4096 revolutions.
Serial Interface	Serial communication is available on some feedback devices. It is the process of sending data one bit at one time, sequentially, over a communication channel. The specification normally used to define this method of communication is the EIA485 specification. These can be synchronous, which means that they operate with additional clock channels. The main advantage of synchronous data transmission is that it can operate at high speed. A disadvantage is that if the receiver goes out of synchronisation it can take time for it to resyncronise and data may be lost. Note that not all serial interfaces use the clock channels. Serial interface communication allows data to be sent and received from the feedback device. In addition to the position and speed data other information can be sent such as multi-turn count, absolute position and diagnostic information.
Synchronous	If something is synchronous it means that events are coordinated in time. For serial interfaces this means that clock channels are used.
Asynchronous	If something is asynchronous it means that events are not coordinated in time. For serial interfaces this means that clock channels are not used.
Speed	Speed is the rate of change in position which can be either angular or linear traveled per unit of time. For rotational motors this is usually defined as revolutions per minute (RPM).
Volatile	Stored information will be lost when power is removed.
Non volatile	Stored information will not be lost when power is removed.

4.14 Brake specification

Unimotor fm may be ordered with an internal rear mounted spring applied parking brake. The brake works on a fail safe principle: the brake is active when the supply voltage is switched off and the brake is released when the supply voltage is switched on.

The standard parking brake, noted by the 1 code in the part number, consists of spring applied plates operating onto a fibre plate. The high energy parking brake, noted by the 5 code in the part number, consists of spring applied plates operating onto a fibre plate that is mounted onto an aluminum disc. This arrangement allows for more energy to be dissipated while braking, as the heat is transferred into the aluminium disc, which in turn gives a high braking torque.

If a motor is fitted with a fail safe brake, take care not to expose the motor shaft to excessive torsional shocks or resonances when the brake is engaged or disengaged. Doing so can damage the brake.

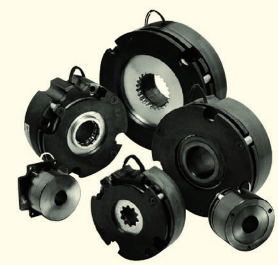
Note.

Shunting the brake with an external diode to avoid switching peaks increases the release time considerably. This is usually required to protect solid state switches, or to reduce arcing at the brake relay contacts (Diode 1N4001 recommended)

SAFETY NOTE

The Fail-Safe Brake is for use as a holding brake with the motor shaft stationary.

Do NOT use it as a dynamic brake, except for emergencies such as a mains supply failure.



4.14.1 Unimotor fm

Motor frame	Supply volts	Input power	Static torque		Release time	Moment of inertia	Backlash
			Standard brake (1)	High energy brake (5)			
Size	Vdc	Watts	Nm	Nm	ms nom	kgcm² *	Degrees**
055	24	6.3	1.8	N/A	22	0.03	0.75
075	24	6.3	2	2.2	22	0.07	1.03
095	24	16	11	12.2	60	0.39	0.94
115	24	16	11	12.2	60	0.44	0.56
142	24	19.5	18	22	75	0.54	0.56
190 (A-D)	24	25	38	42	95	3.07	0.77
190 (E-H)	24	25	60	67	120	4.95	0.77
250	24	62	N/A	135	252	16.37	0.77

*Note 1 kgcm² = 1x10-4kgm² **Backlash figure will increase with time

- The brakes are intended for parking duty and are not for dynamic or safety use
- Refer to your Drive Centre or Distributor if your application requires dynamic braking in emergency conditions
- To provide protection to the brake control circuit it is recommended that a diode is connected across the output terminals of the solid state or relay contacts devices
- Larger torque brakes are available as an option. Contact your Drive Centre or Distributor for details
- Figures are shown at 20°C brake temperature. Apply the derate factor of 0.7 to the standard brake torque figures if motor temperature is above 100°C. A derate factor of 0.9 applies to the high energy brake if motor temperature is above 100°C
- The brake will engage when power is removed

4.14.2 Unimotor hd

Motor frame	Supply volts	Input power	Static torque		Release time	Moment of inertia	Backlash
			Standard parking brake (01)	High energy parking brake (05)			
Size	Vdc	Watts	Nm	Nm	ms nom	kgcm² *	Degrees**
055	24	6.3	1.8	N/A	22	0.03	0.73
067	24	10.2	N/A	4	<50	0.073	0.75
089	24	23.35	N/A	10	<50	0.115	0.75
115	24	19.5	N/A	25	120	0.327	0.75
142	24	25	N/A	42	95	2.54	0.77
190 C-D	24	25	N/A	67	120	4.57	0.77
190 F	24	54.5	N/A	100	TBD	7.72	0.75

*Note 1 kgcm² = 1x10-4kgm² **Backlash figure will increase with time

- The brakes are intended for parking duty and are not for dynamic or safety use
- The brake will engage when power is removed.
- Refer to your Drive Centre or Distributor if your application requires dynamic braking in emergency conditions.
- To provide protection to the brake control circuit it is recommended that a diode is connected across the output terminals of the solid state or relay contacts devices.
- Figures are shown at 20° ambient. Apply a de rate factor of 0.7 to the standard brake torque figures if motor temperature is above 100°C

4.15 Radial load

When selecting a motor some consideration must be made to the loading that the required application will put on the motor shaft. All shaft loads are transferred to the motor's bearing system, so a poorly selected motor could result in premature bearing failure.

Maximum axial and radial load

The following graphs show the Unimotor in terms of bearing strength. It has to be noted that the graphs are based on theoretical calculation, and that the bearing life of the motor is affected by the following:

- Speed
- Radial load applied to the bearings
- Axial load applied to the bearings
- Shock and vibration (external shock/vibration applied to the motor)
- Bearing temperature
- Bearing cleanliness
- Motor mounting to the application

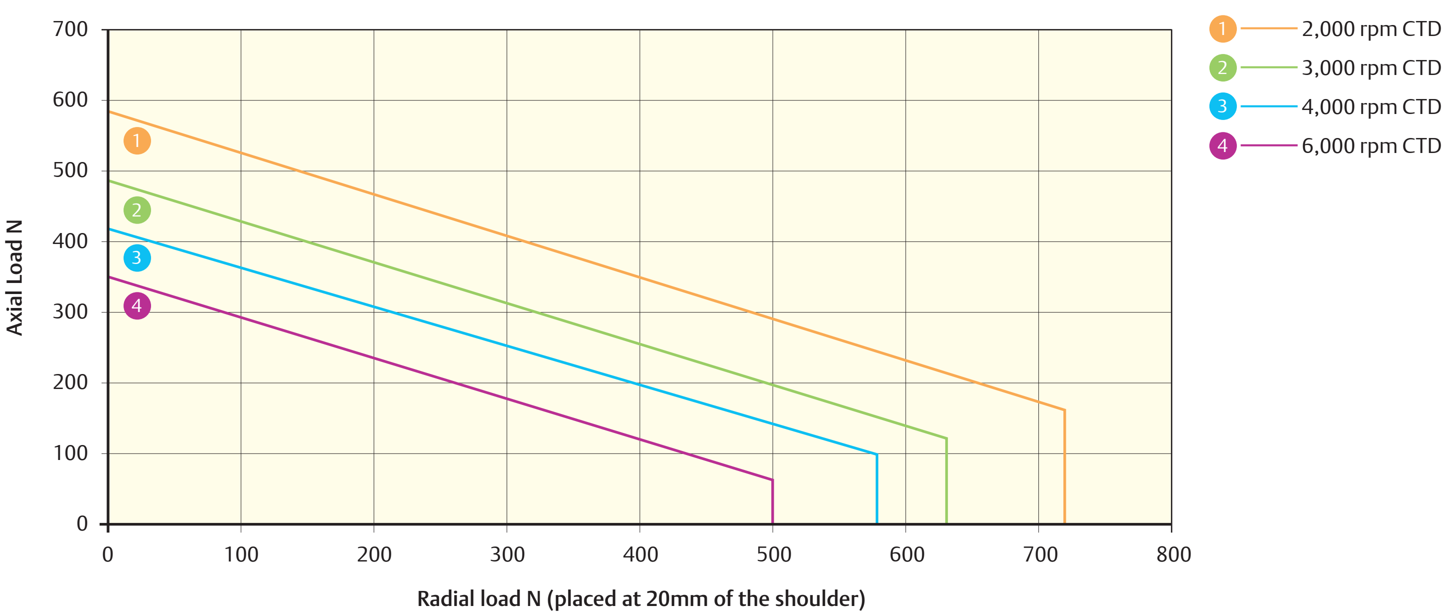
The loads in the following graphs have been calculated using ISO 281 calculation L10(h). The loads and speeds used are considered to be constant throughout the life of the bearing.

The following factors have been taken into consideration when calculating the loads:

- 90% reliability
- Radial load applied on the output shaft away from the shoulder and constant. The distance can be read on the different graphs
- Axial load going toward the motor and constant
- Load factor of 1: no vibration applied to the motor
- Temperature of the bearing: 100°C max
- Grease clean

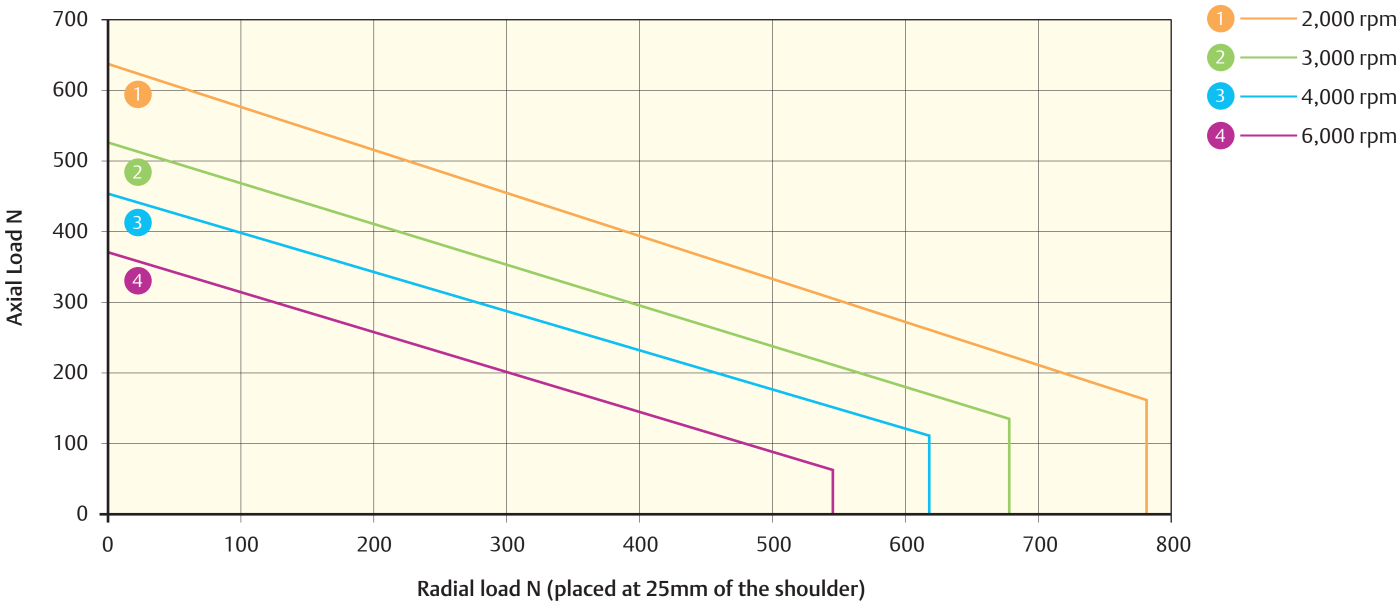
4.15 Radial load Unimotor fm

Radial load vs. axial load on 75U2 (and 75E2)



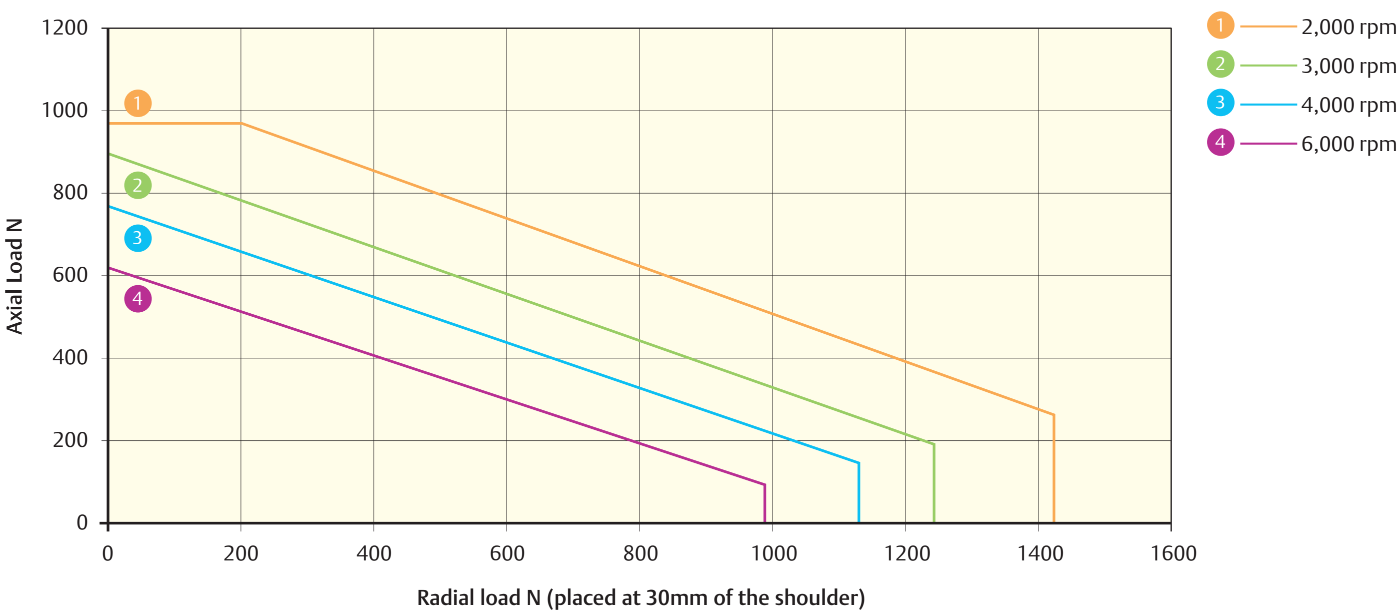
75U2 $L_{10(h)}$ Bearing life for 20,000 hours (reliability 90%, load factor of 1). Do not exceed a maximum axial load of 900 N

Radial load vs. axial load on 95U2 (and 95E2)



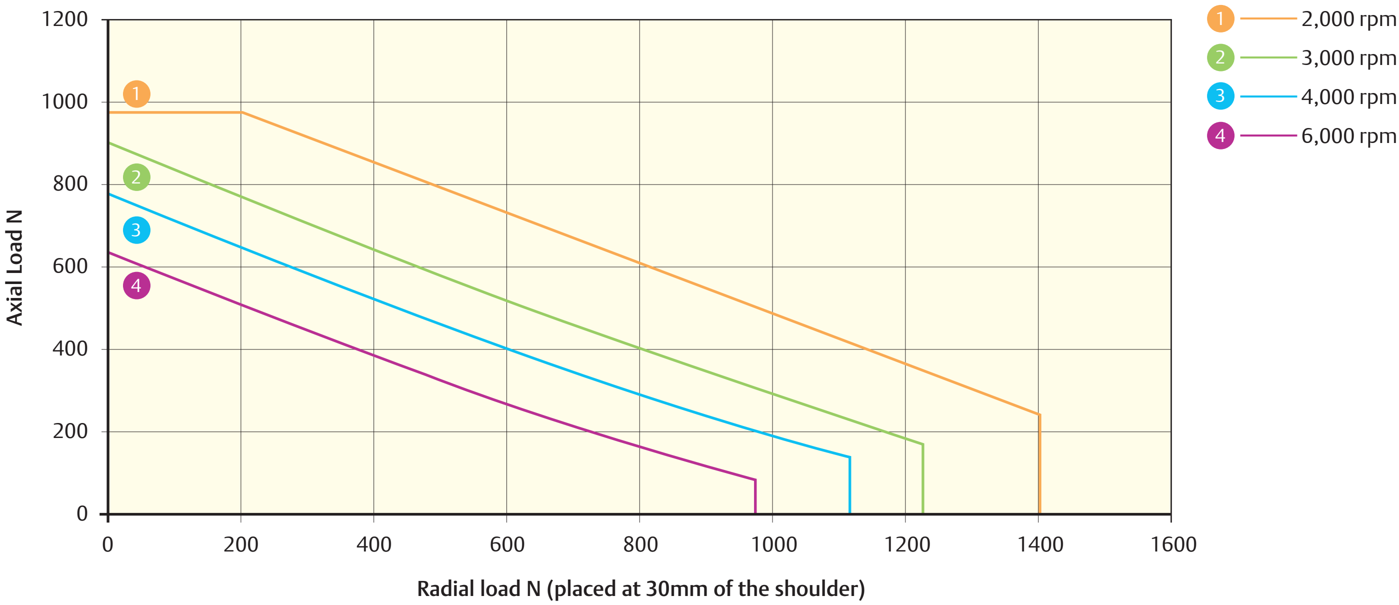
95U2 L $_{10(h)}$ Bearing life for 20,000 hours (reliability 90%, load factor of 1). Do not exceed a maximum axial load of 850 N

Radial load vs. axial load on 115U2 (and 115E2)



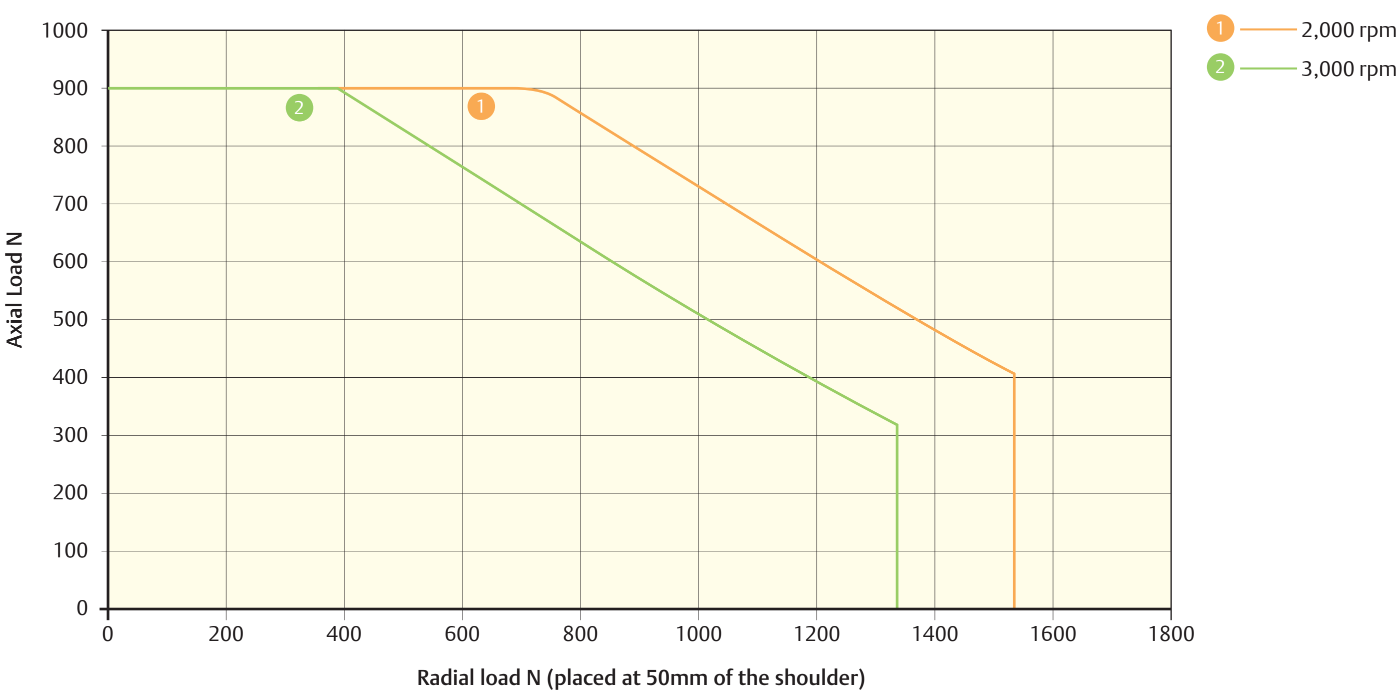
115U2 L $_{10(h)}$ Bearing life for 20,000 hours (reliability 90%, load factor of 1). Do not exceed a maximum axial load of 950 N

Radial load vs. axial load on 142U2 (and 142E2)



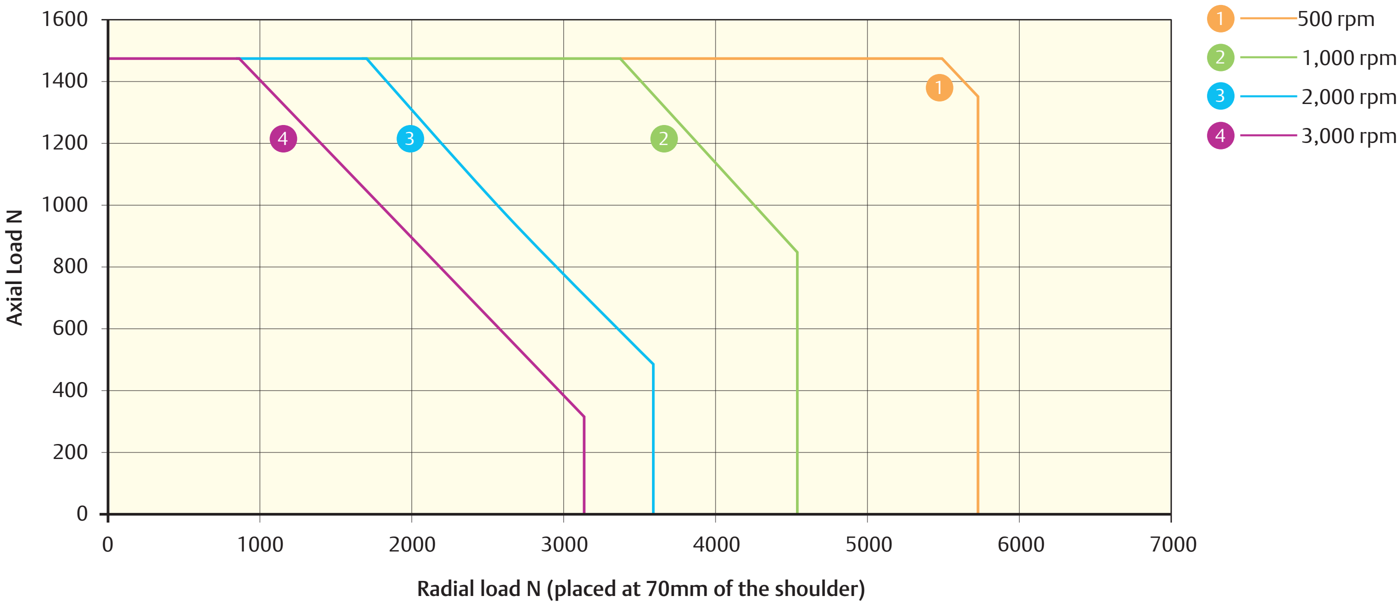
142U2 $L_{10(h)}$ Bearing life for 20,000 hours (reliability 90%, load factor of 1). Do not exceed a maximum axial load of 950 N

Radial load vs. axial load on 190U2 (and 190E2)



190U2 $L_{10(h)}$ Bearing life for 20,000 hours (reliability 90%, load factor of 1). Do not exceed a maximum axial load of 900 N

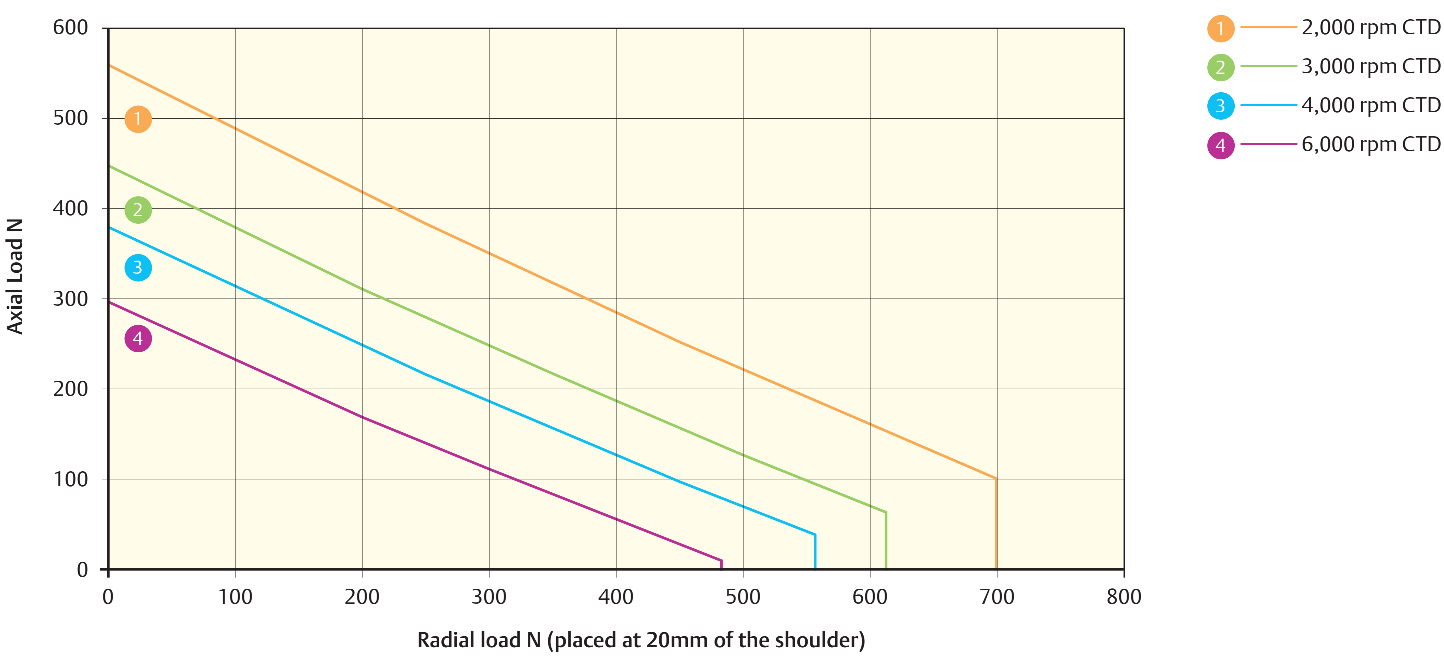
Radial load vs. axial load on 250U2 (and 250E2)



250U2 $L_{10(h)}$ Bearing life for 20,000 hours (reliability 90%, load factor of 1). Do not exceed a maximum axial load of 1450 N

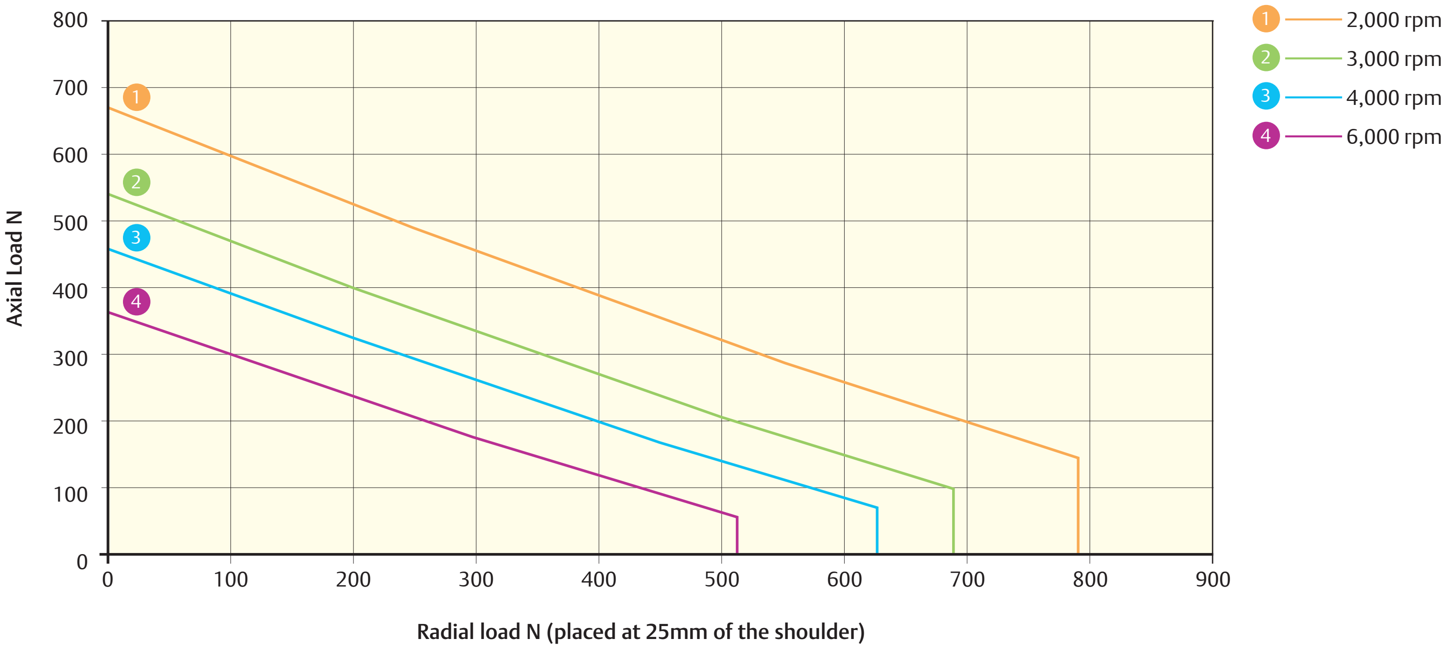
4.15.2 Unimotor hd

Radial load vs. axial load on 067UD (and 067ED)



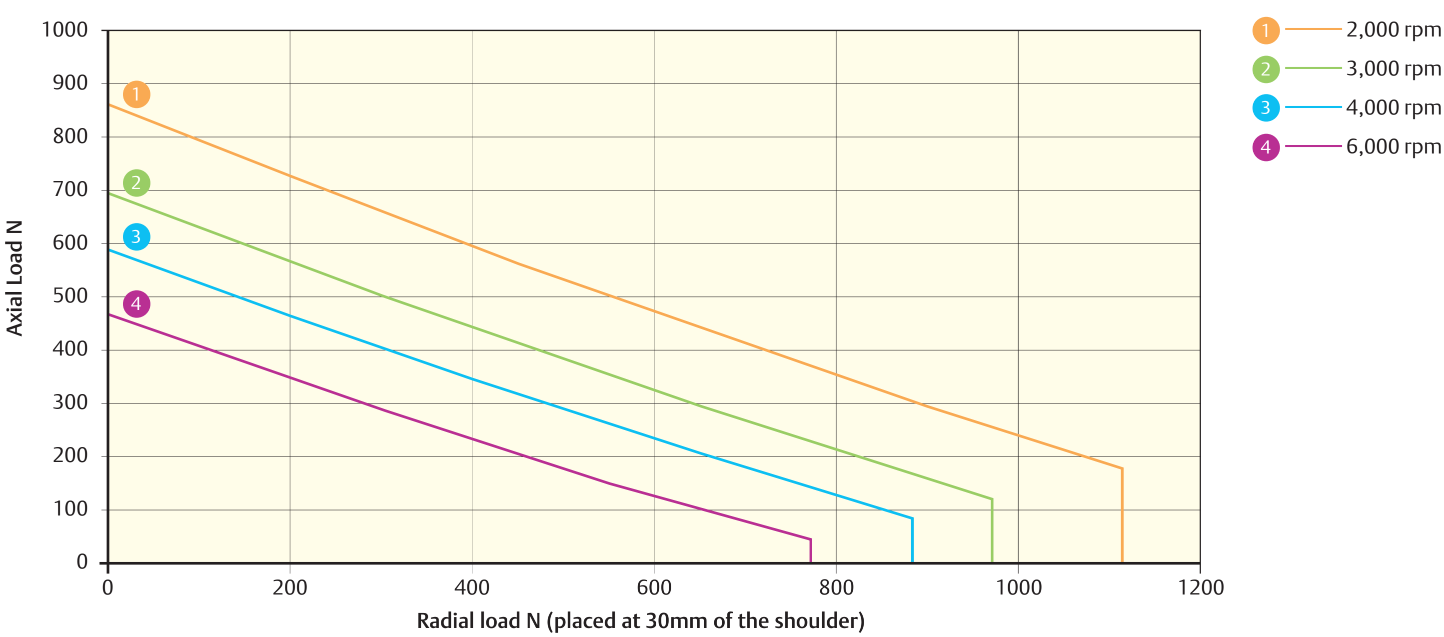
067UD $L_{10(h)}$ Bearing life for 20,000 hours (reliability 90%, load factor of 1). Do not exceed a maximum axial load of 650 N

Radial load vs. axial load on 089UD (and 089ED)



089UD L $_{10(h)}$ Bearing life for 20,000 hours (reliability 90%, load factor of 1). Do not exceed a maximum axial load of 1000 N

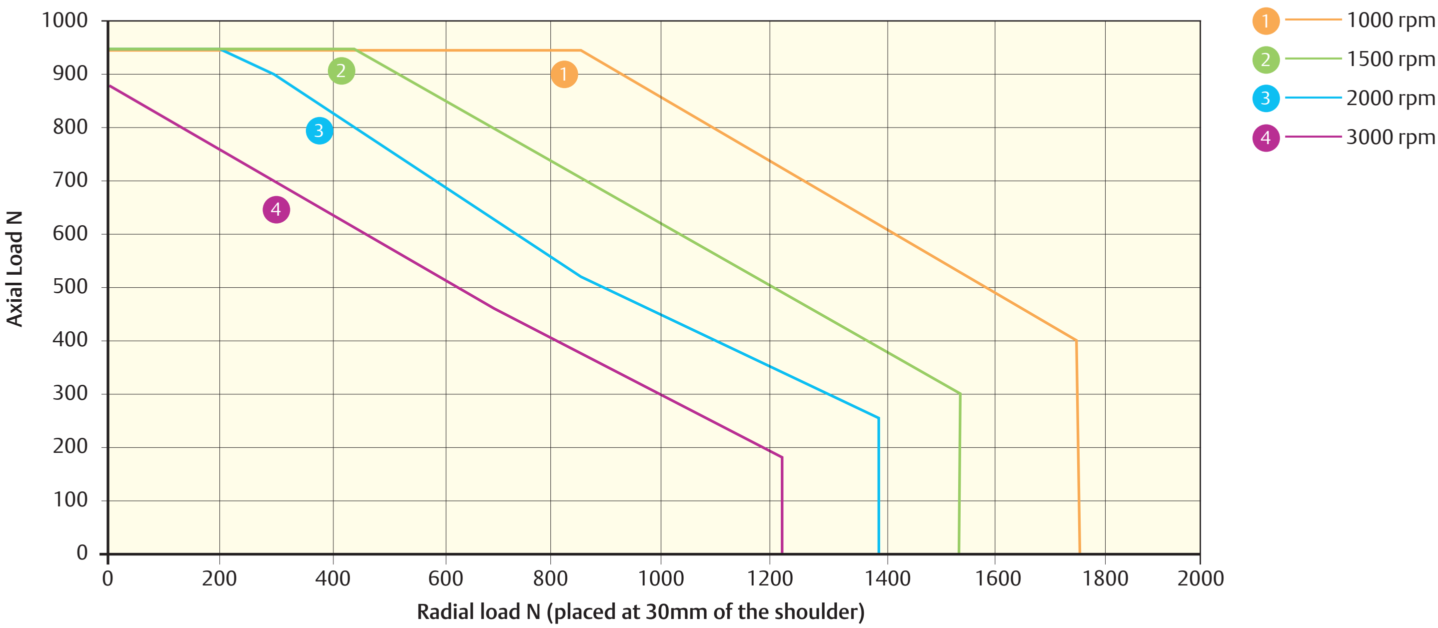
Radial load vs. axial load on 115UD (and 115ED)



115UD L $_{10(h)}$ Bearing life for 20,000 hours (reliability 90%, load factor of 1). Do not exceed a maximum axial load of 1200 N

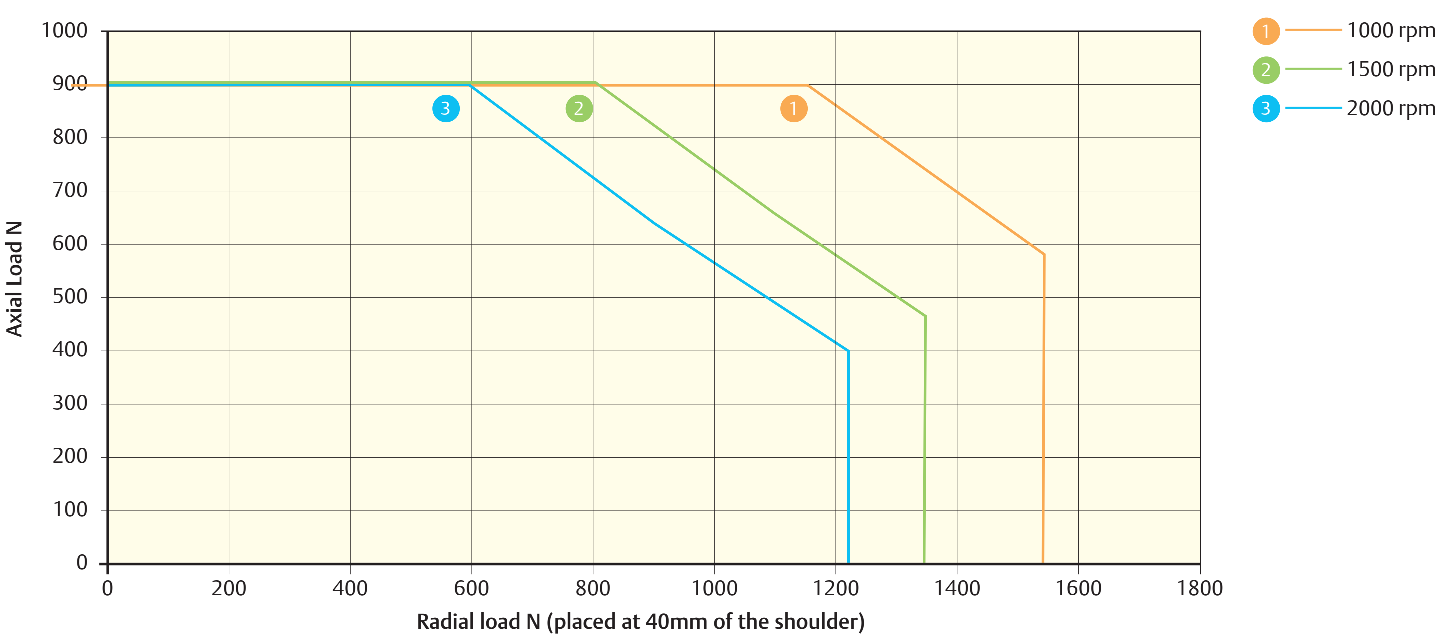
It can be seen on some graphs that the curve line becomes horizontal. This is due to the axial pushing load on the shaft (see *Shaft push back load*). This limit should not be exceeded in case the shaft moves.

Radial load vs. axial load on 142UD (and 142ED)



142UD $L_{10(h)}$ Bearing life for 20,000 hours (reliability 90%, load factor of 1). Do not exceed a maximum axial load of 950 N

Radial load vs. axial load on 190UD (and 190ED)



190UD $L_{10(h)}$ Bearing life for 20,000 hours (reliability 90%, load factor of 1). Do not exceed a maximum axial load of 900 N

4.16 Bearing life and output shaft strength

The maximum output shaft that can be machined on the motor is determined by the inner diameter of the bearings. The bearing sizes on Unimotor fm motors have increased in comparison with the Unimotor UMs and this allows a larger output shaft to be machined. Larger output shafts mean stronger output shafts.

The following graphs show this improvement.

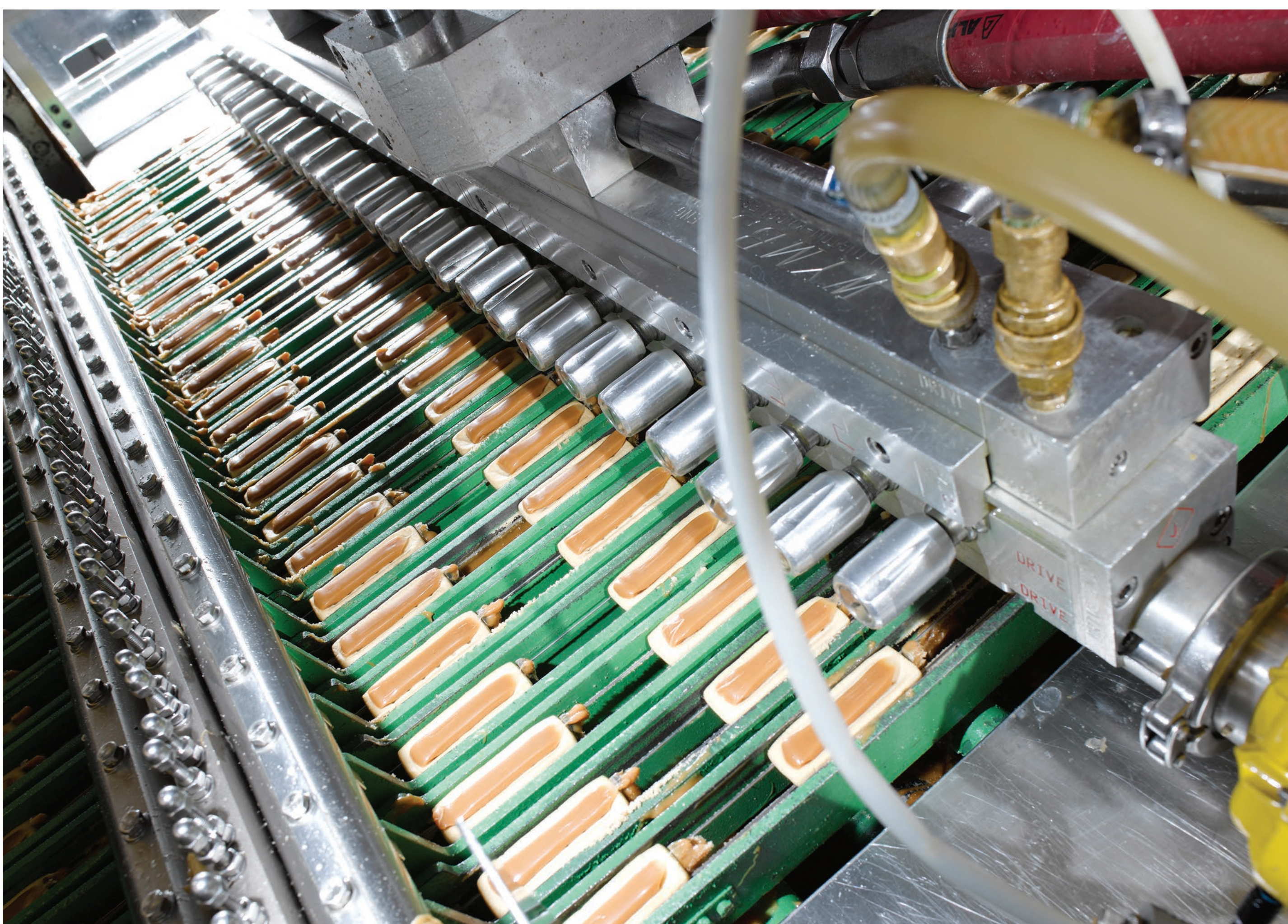
Maximum Bearing life

It has to be noted that the graphs are based on theoretical calculations and the motor is affected by the following.

- ➜ Speed
- ➜ Radial load applied to the bearings
- ➜ Axial load applied to the bearings
- ➜ Shock and vibration (external shock/vibration applied to the motor)
- ➜ Bearing temperature
- ➜ Bearing cleanliness
- ➜ Motor mounting to the application

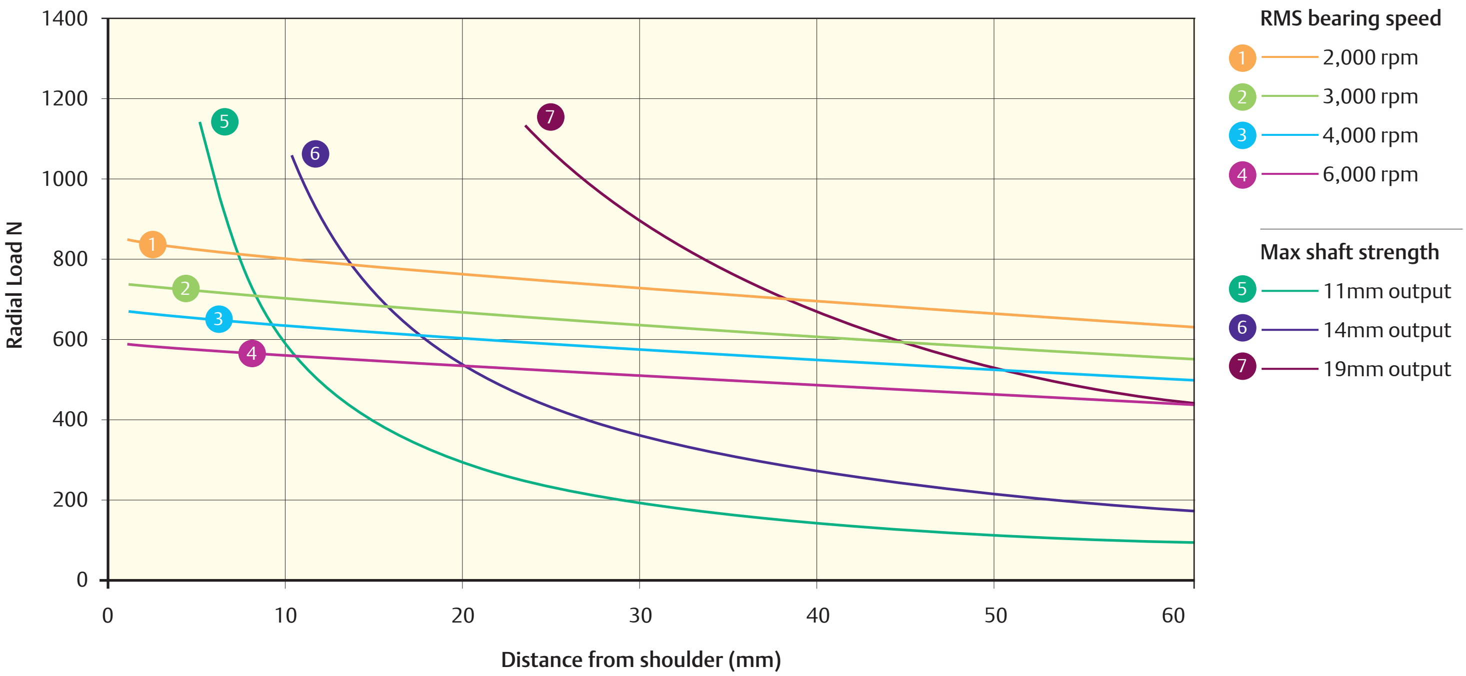
The loads in the following graphs have been theoretically calculated. The following factors were taken into consideration:

- ➜ 90% reliability (for bearing life only)
- ➜ Radial load applied on the output shaft away from the shoulder and constant. The distance can be read on the different graphs.
- ➜ Axial loads going towards the motor and constant (Axial load = 0Nm)
- ➜ Load factor of 1: no vibration applied to the motor (for bearing life only).
- ➜ Temperature of the bearing: 100°C max.
- ➜ Grease clean (for bearing life only).
- ➜ Torque alternating (for shaft strength only).



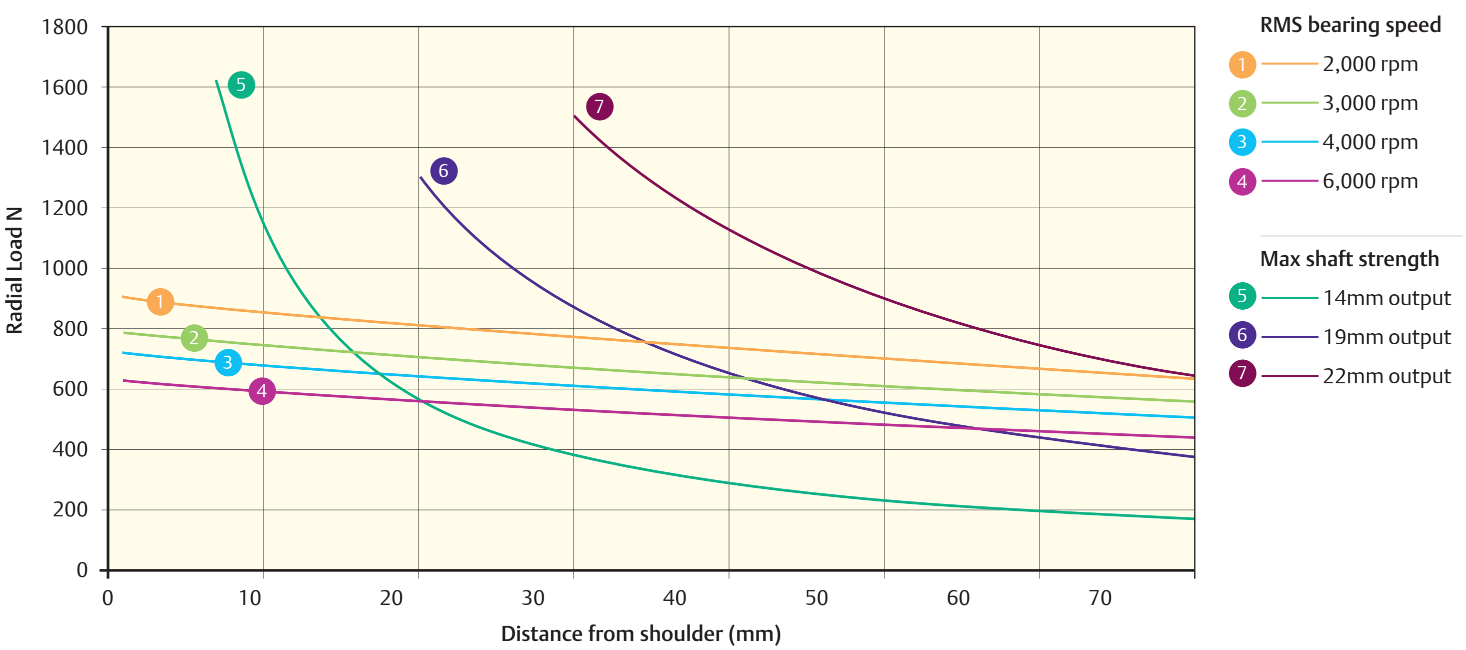
4.16.1 Unimotor fm

Bearing life and output shaft strength on 75U2



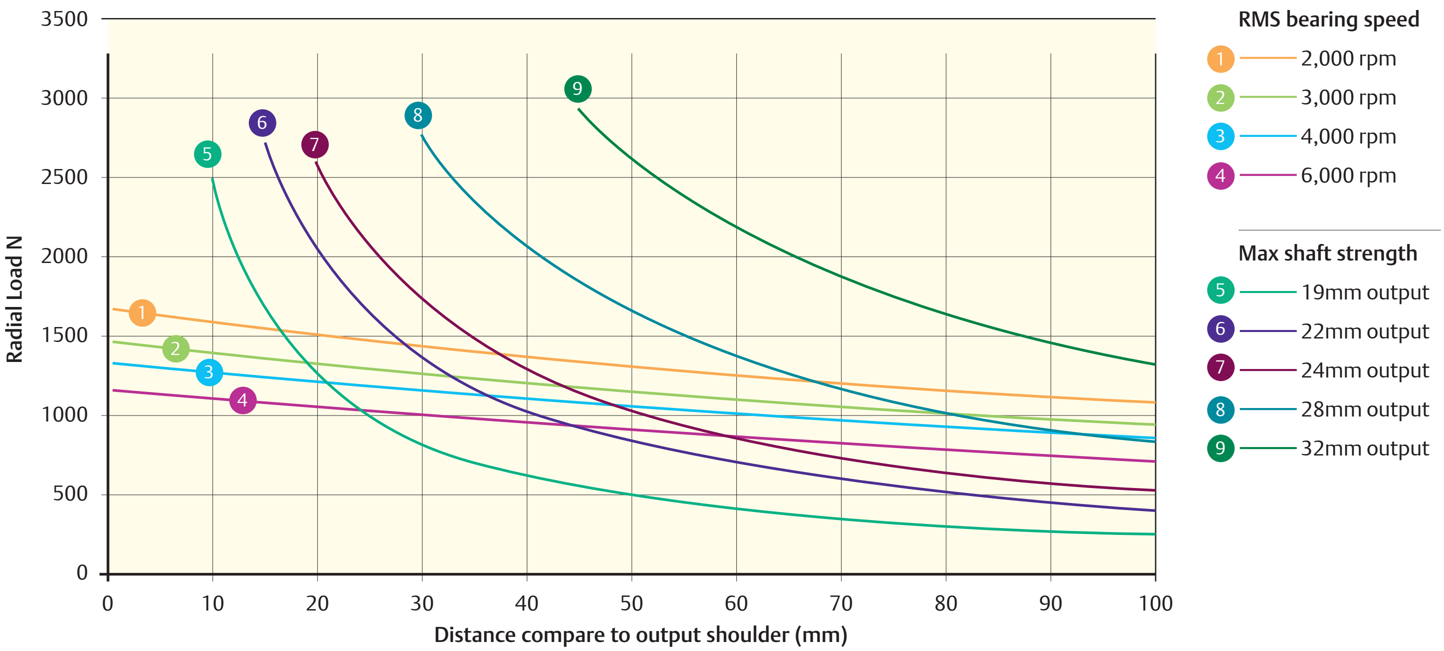
75U2 L $_{10(h)}$ Bearing life for 20,000 hours (reliability 90%, load factor of 1)

Bearing life and output shaft strength on 95U2



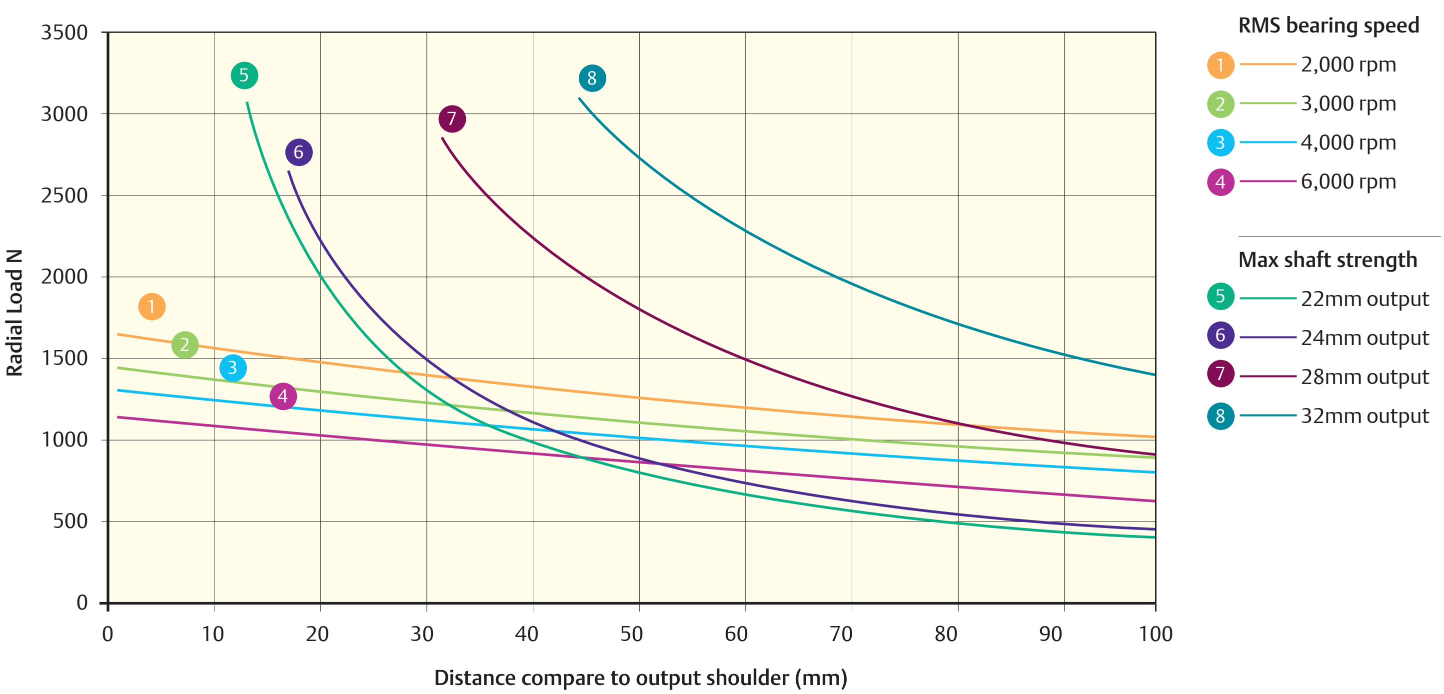
95U2 L $_{10(h)}$ Bearing life for 20,000 hours (reliability 90%, load factor of 1)

Bearing life and output shaft strength on 115U2



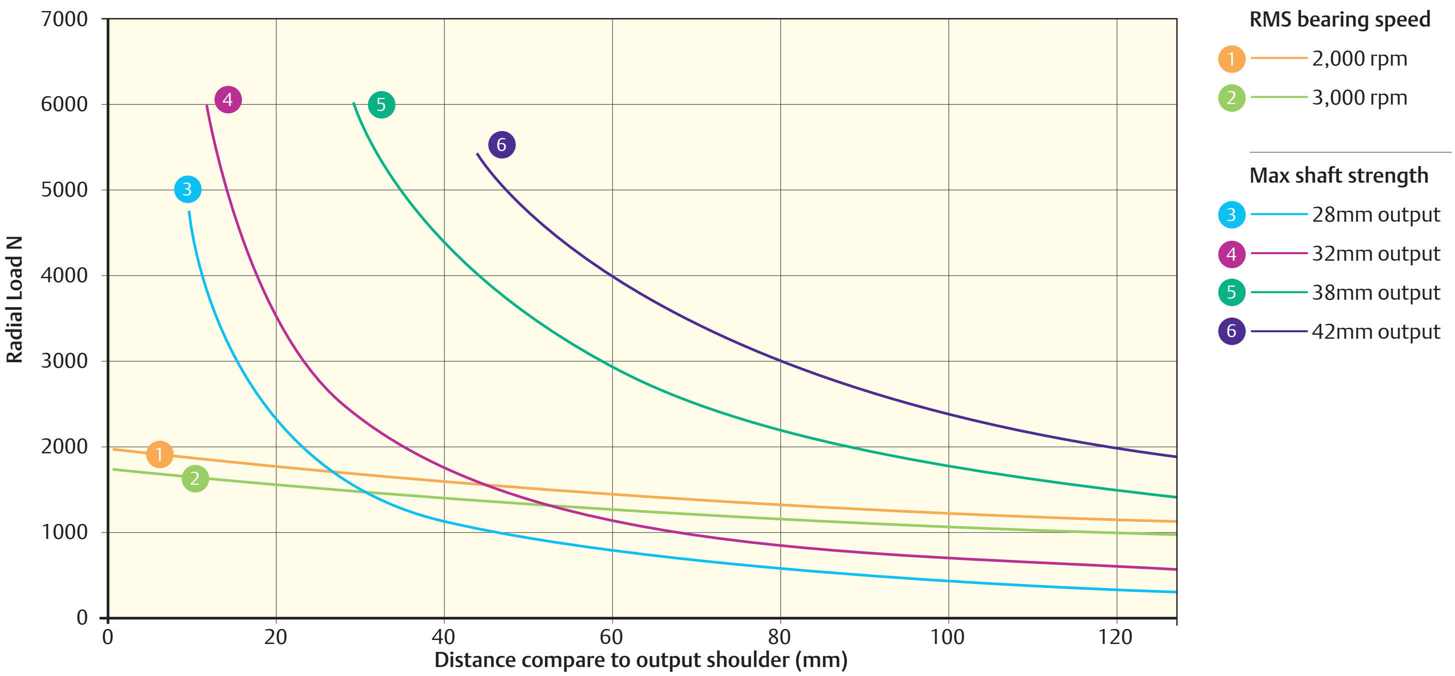
115U2 $L_{10(h)}$ Bearing life for 20,000 hours (reliability 90%, load factor of 1)

Bearing life and output shaft strength on 142U2



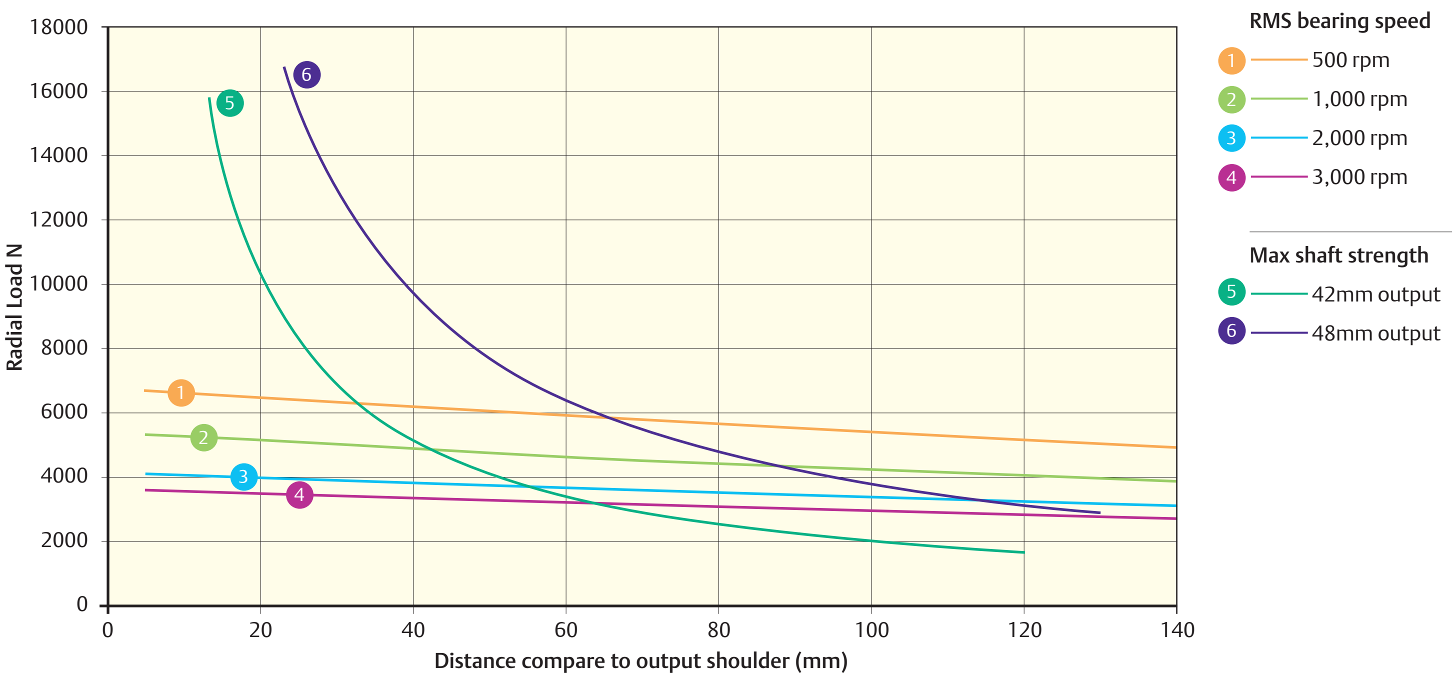
142U2 $L_{10(h)}$ Bearing life for 20,000 hours (reliability 90%, load factor of 1)

Bearing life and output shaft strength on 190U2



190U2 L $_{10(h)}$ Bearing life for 20,000 hours (reliability 90%, load factor of 1)

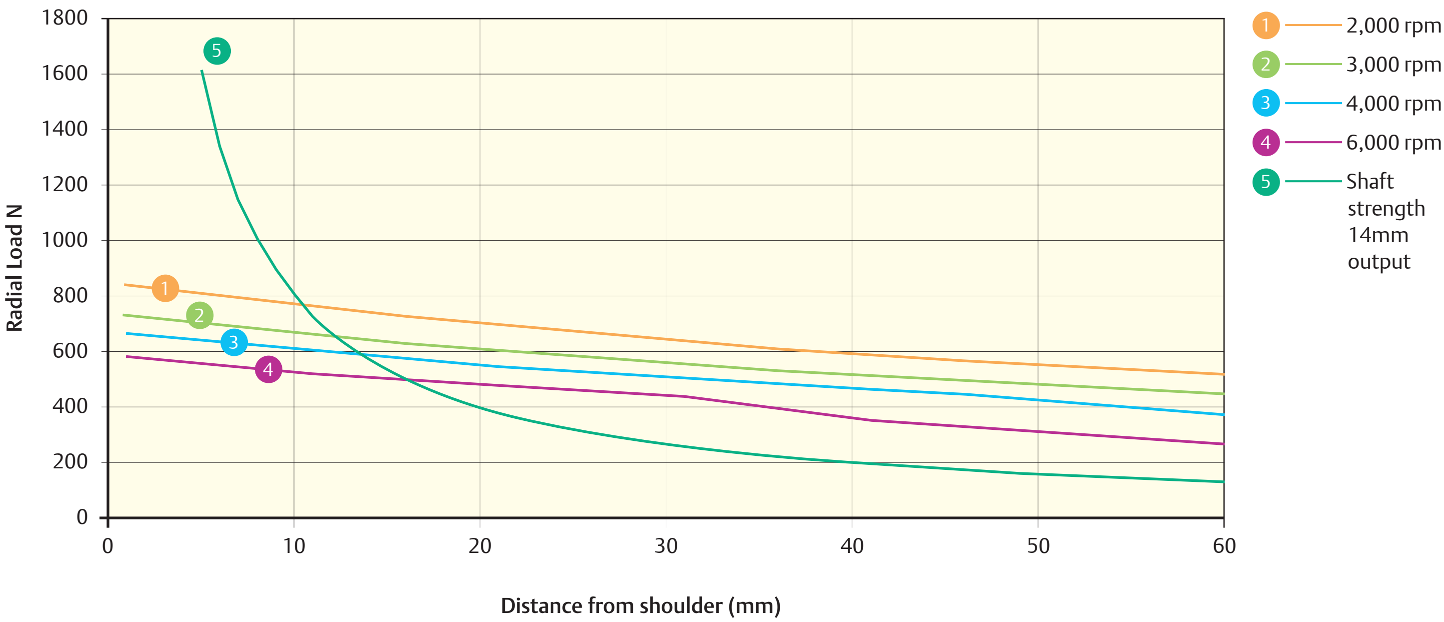
Bearing life and output shaft strength on 250U2



250U2 L $_{10(h)}$ Bearing life for 20,000 hours (reliability 90%, load factor of 1)

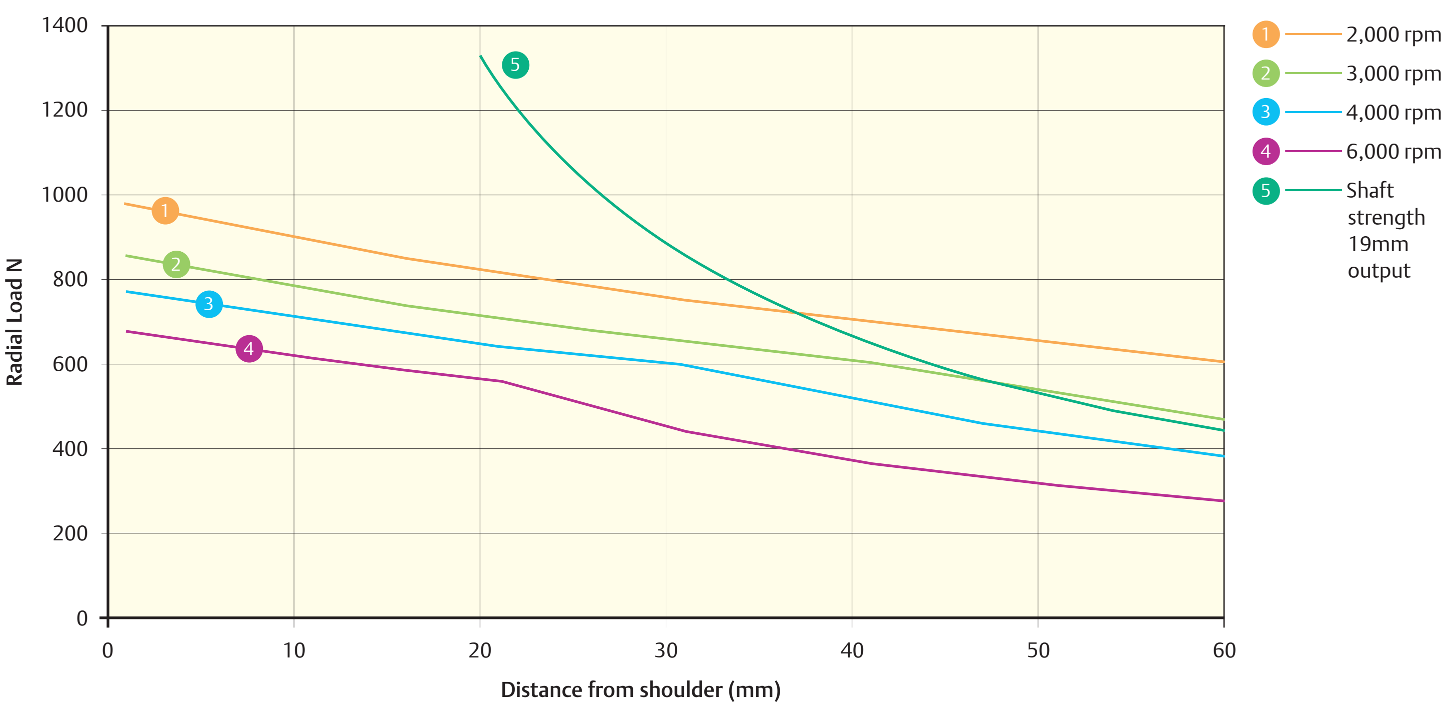
4.16.2 Unimotor hd

Bearing life and output shaft strength on 067UD



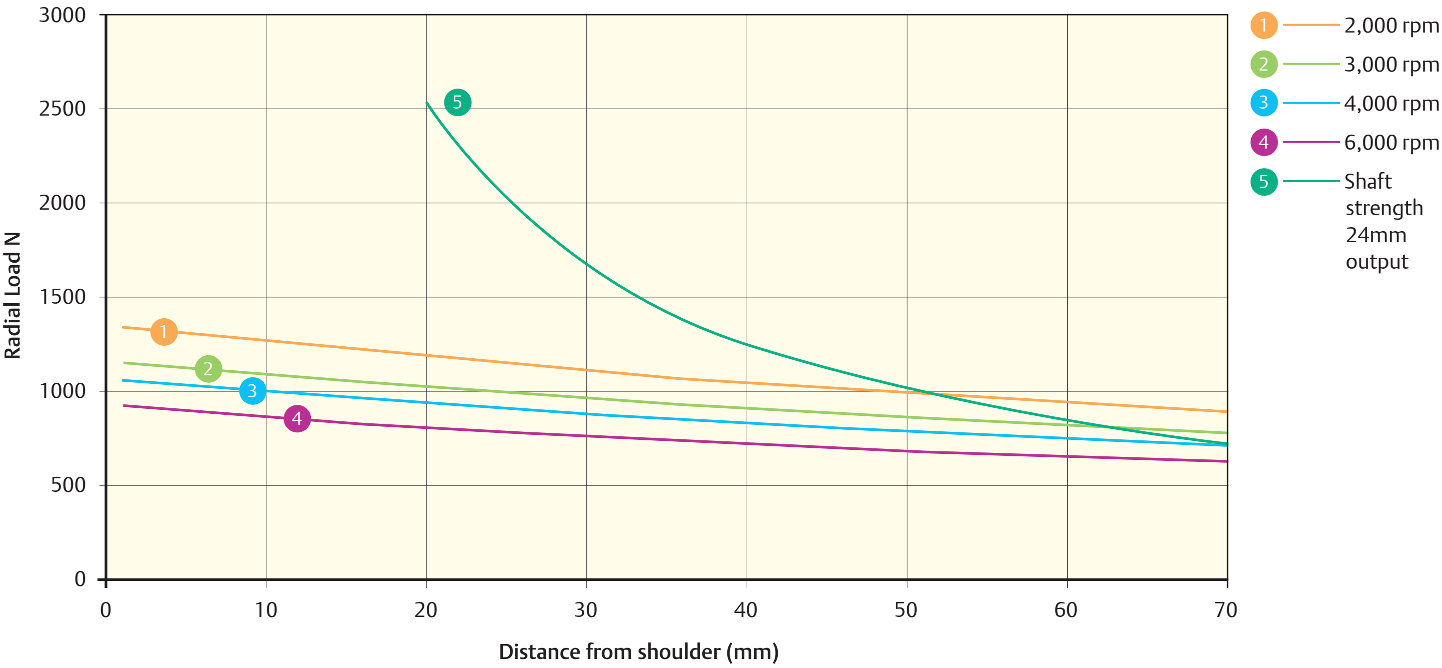
067UD L $_{10(h)}$ Bearing life for 20,000 hours (reliability 90%, load factor of 1).

Bearing life and output shaft strength on 089UD

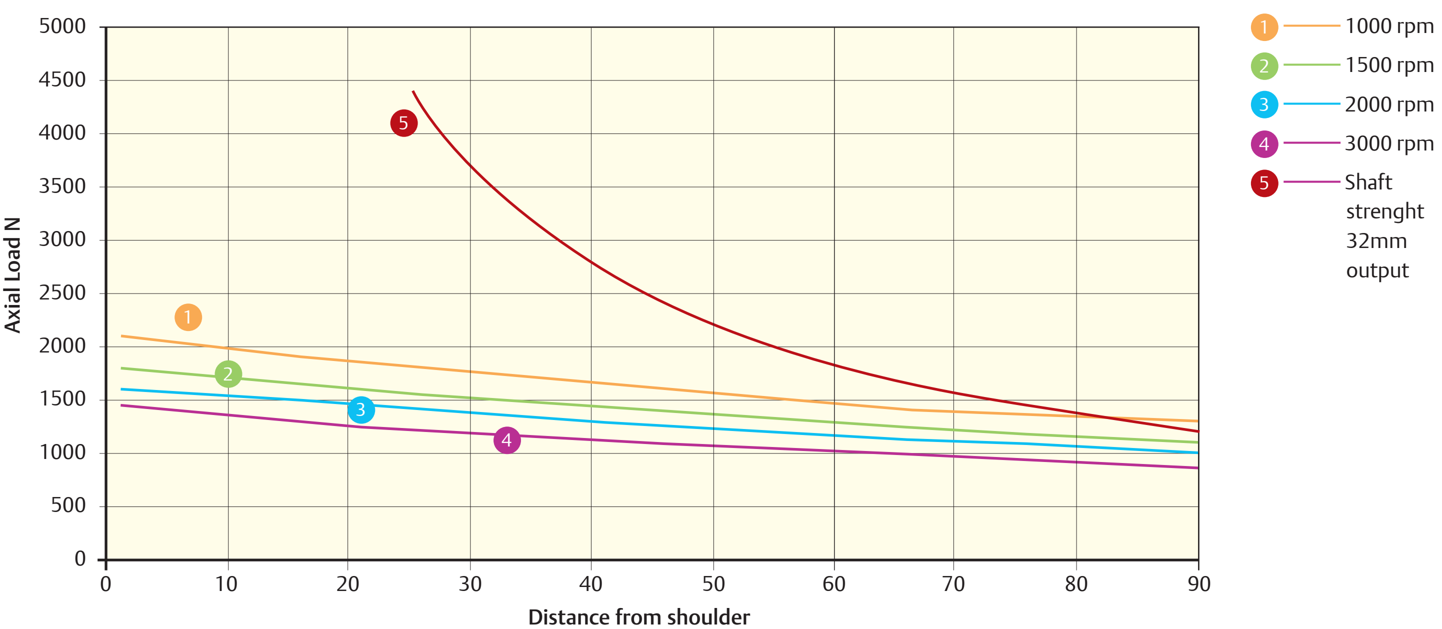


089UD L $_{10(h)}$ Bearing life for 20,000 hours (reliability 90%, load factor of 1).

Bearing life and output shaft strength on 115UD

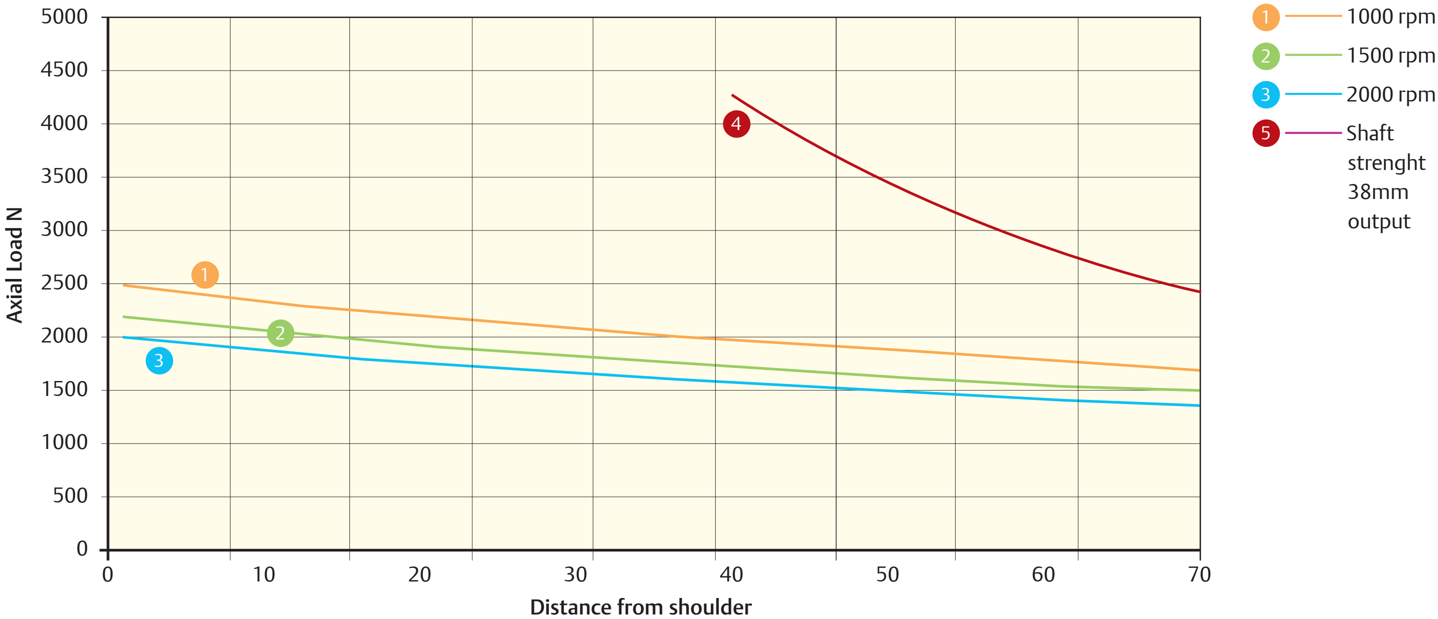


Radial load vs. axial load on 142UD



11542 $L_{10(h)}$ Bearing life for 20,000 hours (reliability 90%, load factor of 1).

Radial load vs. axial load on 190UD



190UD L $_{10(h)}$ Bearing life for 20,000 hours (reliability 90%, load factor of 1).

115UD L $_{10(h)}$ Bearing life for 20,000 hours (reliability 90%, load factor of 1)

Shaft push back load

The minimum pushing load needed to move the rotor relative to the bearings.

The table (right) shows the minimum push back force on Unimotor.

Motor	Push back force (N)
Unimotor FM	
075	900
095	850
115	950
142	950
190	900
250	1450
Unimotor HD	
067	650
089	1000
115	1200

EMERSON
Industrial Automation

5 Motor and signal cables

Cables are an important part of a servo system installation. Not only must the noise immunity and integrity of the cabling and connectors be correct, but also SAFETY and EMC regulations must be complied with to ensure successful, reliable and fail safe operation. One of the most frequent problems experienced by motion systems engineers is incorrect connections of the motor to the drive.

Control Techniques Dynamics ready made cables mean system installers can avoid the intricate, time consuming assembly normally associated with connecting servo systems. Installation and set-up time are greatly reduced - there is no fiddling with wire connections and crimp tools, and no fault finding.

The cables are made to order in lengths from 1m to 50m/100m.

Cable range for motor-drive combination

- Unimotor fm U2 /U4 and Unimotor hd UD to Unidrive SP
- Unimotor fm E2 and Unimotor hd ED to Unidrive SP low voltage and Epsilon EP
- Unimotor fm and Unimotor hd to Digitax ST / Unidrive SP size 0

Power cable variants

- Phase conductors 1.0mm² (10A) to 16mm² (70A)
- With and without brake wire pairs
- Motor end connector
- Motor end Ferrules for Hybrid box
- Drive end is tailored to suit the drive and can be ferrules or ring terminals

Cable features

- For dynamic performance PUR outer sheath for oil resistance and dynamic performance. The PUR jacket has excellent abrasion, chemical and ozone resistance, low smoke, low halogen flame retardant construction suitable for internal and external industrial environments.
- OFS outer sheath for oil resistance and static performance.
- Complies with DESINA coding - Orange for power, Green for signal
- Power cable and plugs UL recognised
- Optimum noise immunity
- Encoder cable has low volt drop for long cable lengths and separately screened thermistor wires.
- No need for crimp and insertion / removal tools
- Production build gives quality and price benefits
- Power cables with and without brake wires
- Cable assembly type identification label
- Brake wires are separately shielded within the power cable

Power – PUR Basic cable types

Phase & conductor size (current rating Cenlec EN60204.1)	Power plug size	Current rating	Overall cable diameter (mm)	
			No brake	Braked
G – 1.5mm² (16A)	Size 1	30A sockets	8.5	10.8
A – 2.5mm² (22A)			10.0	12.6
B – 4.0mm² (30A)	Size 1 Size 1.5	30A sockets 53A sockets	11.7	14.1
C – 6.0mm² (39A)	Size 1.5	70A sockets	17.4	17.4
D – 10.0mm² (53A)			20.4	20.4
E – 16.0mm² (70A)			23.4	23.4

Note

- Minimum bend radius = 10x dia long travel, 7.5x dia unsupported chain. Bending life 10,000,000 cycles
- Maximum accelaration = 20m/s²
- Temperature rating -10°C to +80°C

Power – OFS basic cable types

Phase & conductor size (current rating Cenlec EN60204.1)	Power plug size	Current rating	Overall cable diameter (mm)	
			No brake	Braked
H – 1.0 mm² (10A)	Size 1	30A sockets	8.2	10.8

Note

- Minimum bend radius = 15x dia long travel
- Maimum accelaration = 6m/s²
- Temperature rating -10°C to +60°C

Signal – PUR basic cable types

Cable type	Cable code	Overall cable diameter (mm)
Encoder / SinCos Heidenhain	SIBA/SSBE	10.9
Resolver / SinCos SICK	SRBA/SSBA	9.6
Encoder	SIBL	8.5

Note

- Minimum bend radius = 10x dia long travel 7.5x dia short unsupported. Bending life 10,000,000 cycles
- Maximum accelaration SRBA/SSBA = 20m/s²
  SIBA/SIBL = 10m/s²
- Temperature rating -10°C to +80°C

Signal – OFS basic cable types

Cable type	Cable code	Overall cable diameter (mm)
Encoder	SICA	
Resolver / SinCos SICK	SRCA/SSCA	

Note

- Minimum bend radius = 15x dia long travel
- Maimum accelaration = 6m/s²
- Temperature rating -10°C to +60°C

Cable information

PS	B	A		F	A	015
Cable type	Jacket	Phase & ground: conductor size		Connection details drive end	Connection details motor end	Cable length
PS = Power (Standard)	B = PUR	H** = 1.0mm^2	10A	C = 6 way power extension connector	A = 055 -142 Unimotor SP 075 -115 Unimotor SP fan blown 055 -115 Unimotor hd size 1 power connector	Min = 001 (1m)
PB = Power (with brake)	C = OFS	G = 1.5mm^2	16A	F = **Unidrive SP** (size 1-2) Ferrules		Max = 100 (100m)
		A = 2.5mm^2	22A	G = **Unidrive SP** (size 3) Ring terminals		
		B = 4.0mm^2	30A	H = **Digitax ST** and SP0 Ferrules	B = 190 - 250 Unimotor SP 142 - 250 Unimotor SP fan blown size 1.5 power connector	
		C* = 6.0mm^2	39A	J = **Unidrive SP** (size 4) Ring terminals		
		D* = 10.0mm^2	53A	K = **Epsilon EP** Ferrules		
		E* = 16.0mm^2	70A	X = Cut end	J = 250 hybrid ferrules	
					X = Cut end	

* Ring terminals for Drive studs only

** Only available in OFS

Cable type	PS for motor without brakes, PB for motors with brake.
Jacket	B is for the PUR sheath and is the Dynamic cable selection. C is for the OFS sheath and is the Static cable selection.
Conductor size	Select the conductor size according to the motors STALL CURRENT. Cables of 6mm^2 and above will be fitted with ring terminals only. Ratings are for individual cables (not lashed together) in free air temperature up to 40°C - make allowances as appropriate.
Connection detail drive end	Select the correct drive end connection for the drive in use.
Connection detail motor end	Select the correct motor end connection for the motor in use.
Length	Numbers represent the required cable length in metres.

SI	B	A	A	A	015
Cable type	Jacket	Special options		Connection details motor end	Cable length*
SI = Incremental Encoder hyperboloid pins	B = PUR	A = Standard cable		A = Encoder 17 pin connector	Min = 001 (1m)
SR = Resolver	C** = OFS	E = Twisted screened SS cable		B = Resolver 12 pin connector	Max = 100 (100m)
SS = Sin/Cos Encoder		L = 8.5mm dia SI cable		C = Sin/Cos 12 pin connector (Hiperface)	
SE = Incremental Encoder split pins				E = 17 pin extension connector	
				F = 90° Encoder 17 pin connector	
				G = 90° Resolver 12 pin connector	
				H = 90° Sin/Cos 12 pin connector (Hiperface)	
				N = Sin/Cos 17 pin connector (EnDat)	
				O = 90° Sin/Cos 17 pin connector (EnDat)	
				X = Cut end	

Connection details drive end
A = **Digitax ST/Unidrive SP/Epsilon EP** Encoder 15 pin connector
B = Resolver / Sin/Cos Ferrules
F = **Epsilon** Encoder 26 pin connector
I = Extension connector male pins
H = **Digitax ST/Unidrive SP** Sin/Cos 15 pin connector
X = Cut end

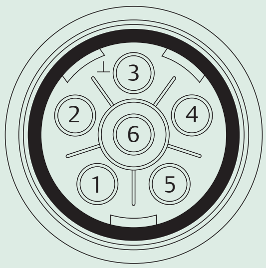
*Max cable length: 50m with the SIBA/SICA as standard, 100m only if +5V tolerance can be maintained. 10m with the SIBL. Heidenhain EC/FC 20m EB/FB 30m with the SSBA cable, EC/FC 20m EB/FB 100m with the SSBE cable.

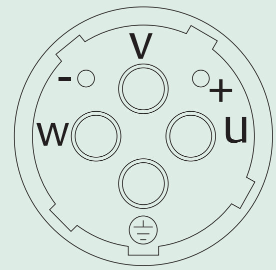
** OFS only available on SI encoder cable

Cable type	Choose the cable type to match the feedback device.
Jacket	B is for the PUR sheath and is the Dynamic cable selection. C is for the OFS sheath and is the Static cable selection.
Special options	A is for standard cable. L is for the low cost 8.5mm incremental cable.
Connection detail drive end	Select the correct drive end connection for the drive in use.
Connection detail motor end	Select the correct motor end connection for the motor feedback device in use.
Length	Numbers represent the required cable length in metres.

5.2 Motor connector details

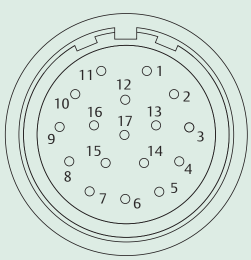
Power plug

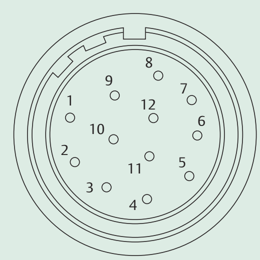




Size 1	With brake	Without brake	Size 1.5	With brake	Without brake
Pin	Function	Function	Pin	Function	Function
1	Phase U (R)	Phase U (R)	U	Phase U (R)	Phase U (R)
2	Phase V (S)	Phase V (S)	V	Phase V (S)	Phase V (S)
3	Ground	Ground	⏚	Ground	Ground
4	Phase W (T)	Phase W (T)	W	Phase W (T)	Phase W (T)
5	Brake		+	Brake	
6	Brake		-	Brake	
Shell	Screen	Screen	Shell	Screen	Screen

Signal plug





	Incremental encoder (CR, MR, KR, CA, MA, KA , CR)	Heidenhain Absolute Encoders (EM, FM, EC, FC, EB, FB, LC, NC, LM, NM)	Resolver (AR, AE)	SICK Sin/Cos encoders (TL, UL, RA, SA)
Pin	Function	Function	Function	Function
1	Thermistor	Thermistor	Excitation High	REF Cos
2	Thermistor	Thermistor	Excitation Low	+ Data
3		Screen (Optical encoder only)	Cos High	- Data
4	S1		Cos Low	+ Cos
5	S1 Inverse		Sin High	+Sin
6	S2		Sin Low	REF Sin
7	S2 Inverse		Thermistor	Thermistor
8	S3	+ Clock	Thermistor	Thermistor
9	S3 Inverse	- Clock		Screen
10	Channel A	+ Cos		0 Volts
11	Index	+ Data		-
12	Index Inverse	- Data		+ V
13	Channel A Inverse	- Cos		
14	Channel B	+ Sin		
15	Channel B Inverse	- Sin		
16	+ V	+ V		
17	0 Volts	0 Volts		
Body	Screen	Screen		Screen

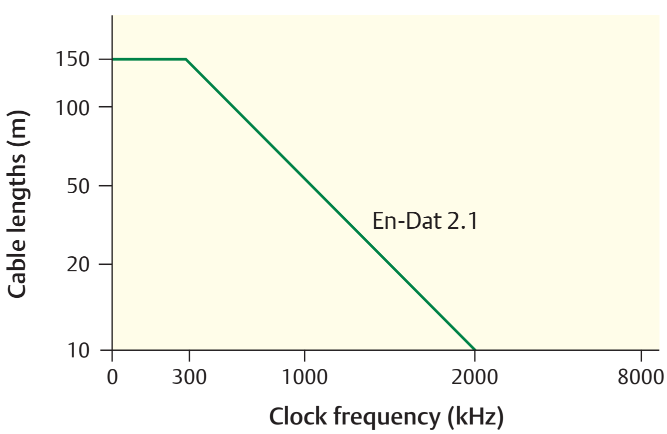
5.3 Maximum cable length

Due to the volt drop down the power lines within the feedback cable, each feedback device has a maximum length restriction placed upon it.

Maximum recommended length

Cable types	Maximum cable length							
	Resolver		Renco	SICK		Heidenhain		
SIBA Incremental			CR TBA	CA/MA/KA 50m				
SRBA Resolver	AE 100m	AR 100m						
SSBA SinCos					RA/SA 100m	EB/FB 30m	EC/FC 20m	EM/FM TBA
SSBE SinCos					RA/SA 100m	EB/FB 100m	EC/FC 20m	EM/FM TBA
SIBA Incremental			CR TBA	CA/MA/KA 10m				

With EnDat 2.1 communication the clock frequency is variable from 100kHz to 2MHz. As long cable runs and high clock frequencies increase the signal run time, due to the propagation delay within the cable, the drive centre must ensure that the correct cable length is used.



IMPORTANT NOTE FOR INDUCTIVE ENCODERS ONLY (EC/FC)

These inductive encoders will require a change to the drive settings as they do not work with the default settings when used in EnDat only mode. This is due to the increase in resolution provided by the EnDat position and the time limit imposed by the drive on how long it takes to obtain the position information from the encoder.

These new inductive encoders only have 32 sine waves per revolution. This means that even with the SinCos interpolation in the drive, a higher resolution can be obtained by using the encoders in EnDat only mode (Pr **3.38** = EndAt) rather than SinCos EnDat mode (Pr **3.38** = SC.EndAt).

The default value of Pr **3.37 (Drive encoder comms baud rate (kbaud)) in Unidrive SP and Digitax ST, is 300 (2)**.

To use the inductive encoder in EnDat only mode the minimum setting must be 400 (3).

To use the inductive encoder in EnDat only mode the recommended setting should be 1500 (6).

The performance of the drive will be reduced if a baud rate of less than 1.5Mbaud is used with these encoders.

Inductive encoder's baud rate/cable length table.

The maximum cable length is restricted by two factors, the encoder supply volt drop down the line, and the baud rate (clock frequency).

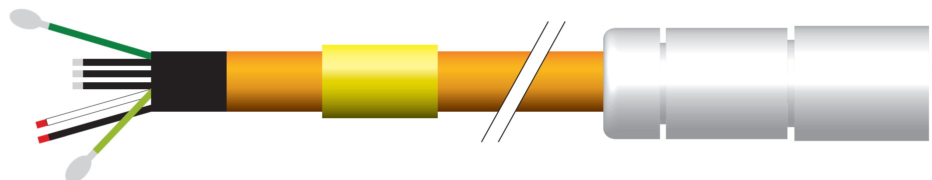
Please use the table below to ensure that the correct baud rate/cable length is selected when using Control Techniques Dynamics cables.

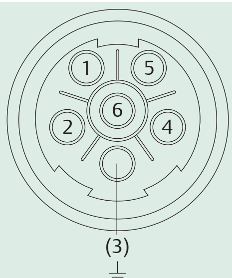
Parameter value	Parameter string	Baud rate	CTD Cable length		Drive sample rate
			SSBE	SSBA	
0	100	100k	N/A	N/A	N/A
1	200	200k	N/A	N/A	N/A
2	300	300k	N/A	N/A	N/A
3	400	400k	90m	25m	Slow
4	500	500k	90m	25m	Slow
5	1000	1M	45m	25m	Slow
6	1500	1.5M	20m	20m	Fast
7	2000	2M	10m	10m	Fast

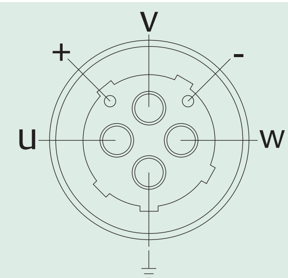
For more information regarding the drive sample rate and the effect of the baud rate, please see parameter 3.37 in the Unidrive SP Advanced User Guide.

5.4 Power cable range

Power cable with brake

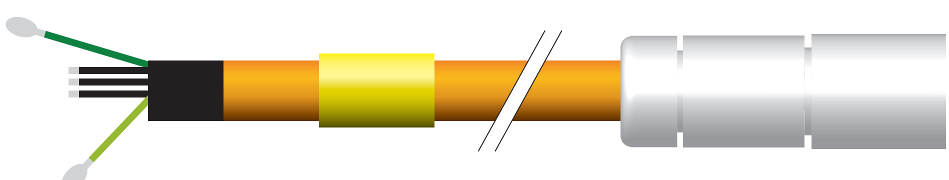


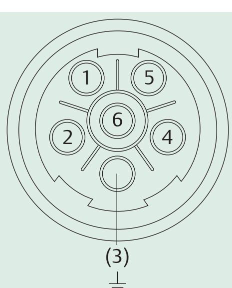


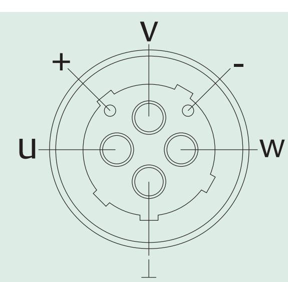


Size 1	With brake	Size 1.5	With brake
Pin	**Function**	**Pin**	**Function**
1	Phase U (R)	U	Phase U (R)
2	Phase V (S)	V	Phase V (S)
3	Ground	⏚	Ground
4	Phase W (T)	W	Phase W (T)
5	Brake	+	Brake
6	Brake	-	Brake
Shell	Screen	Shell	Screen

Power cable without brake

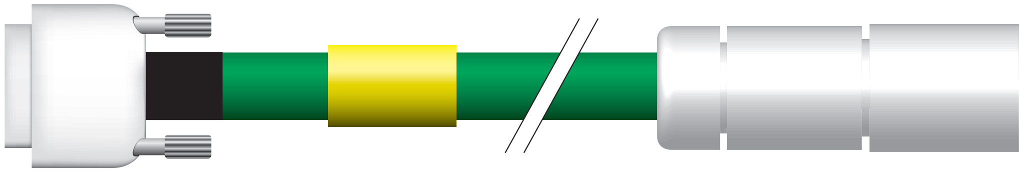






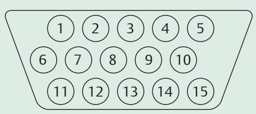
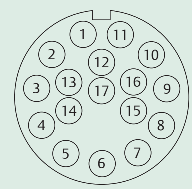
Size 1	Without brake	Size 1.5	Without brake
Pin	**Function**	**Pin**	**Function**
1	Phase U (R)	U	Phase U (R)
2	Phase V (S)	V	Phase V (S)
3	Ground	⏚	Ground
4	Phase W (T)	W	Phase W (T)
5		+	
6		-	
Shell	Screen	Shell	Screen

Signal cable Incremental Encoders SIBAAAxxx or SIBLAAxxx

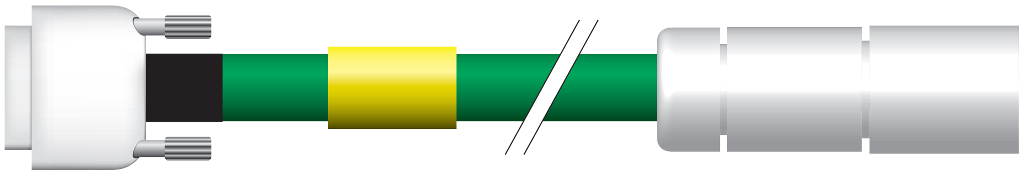


Incremental cable:

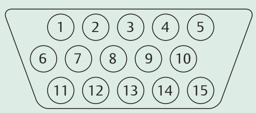
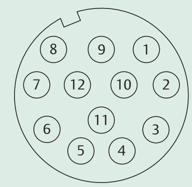
SIBAxxxx, dia 10.9mm, maximum length 50m
SIBLxxxx, dia 8.5mm, maximum length 10m

15-way drive connections		17-way motor encoder plug	
			
Pin	**Colour**	**Pin**	**Function**
Body	White	**1**	Thermistor 0V
15	Brown	**2**	Thermistor Signal
-	**Orange or black**	**3**	Screen
7	Green	**4**	S1
8	Yellow	**5**	S1 Inverse
9	Grey	**6**	S2
10	Pink	**7**	S2 Inverse
11	Black	**8**	S3
12	Purple	**9**	S3 Inverse
1	Grey/Pink Band	**10**	Channel A
5	White/Green Band	**11**	Index
6	Brown/Green Band	**12**	Index Inverse
2	Red/Blue Band	**13**	Channel A Inverse
3	Red(0.34mm²)	**14**	Channel B
4	Blue(0.34mm²)	**15**	Channel B Inverse
13	Red(1.0mm²)	**16**	+Volts
14	Blue(1.0mm²) + White	**17**	0Volts + Thermistor
Body	Screen	**Body**	Screen

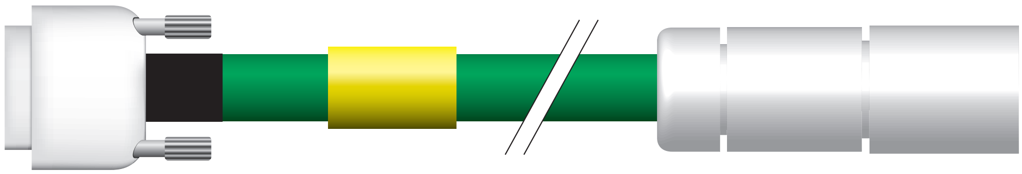
Signal cable SinCos SSBAHCxxx for SICK Encoders



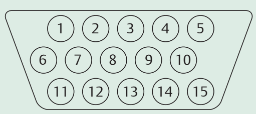
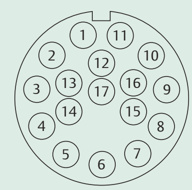
SinCos cable: SSBAxxxxx, dia 9.6mm, maximum length 100m

15-way drive connections		12-way motor encoder plug	
			
Pin	**Colour**	**Pin**	**Function**
2	Red	1	REF Cos
5	Blue	2	+ Data
6	Violet	3	- Data
1	Orange	4	+ Cos
3	Brown	5	+Sin
4	Black	6	REF Sin
14	Yellow	7	Thermistor
15	Green	8	Thermistor
Body	Screen	9	Screen
14	Blue/White(0.5mm²)	10	0 Volts
	-	11	-
13	Red/White(0.5mm²)	12	+ V
Body	Screen	Body	Screen

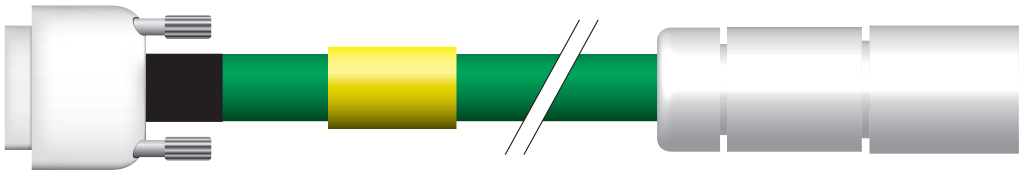
Signal cable SinCos SSBAHNxxx for Heidenhain Encoders



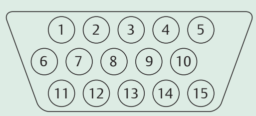
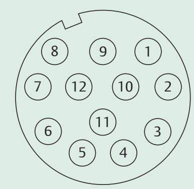
SinCos cable: SSBAxxxxx, dia 9.6mm, maximum length 20m EC/FC, maximum length30m EB/FB

15-way drive connections		17-way motor encoder plug	
			
Pin	**Colour**	**Pin**	**Function**
14	Yellow	1	Thermistor
15	Green	2	Thermistor
Body	Orange or Black	3	Internal cable screen
7		4	
8		5	
9		6	
10		7	
11	Yellow / White	8	+Clock
12	Black / White	9	-Clock
1	Orange	10	+Cos
5	Blue	11	+Data
6	Violet	12	-Data
2	Red	13	-Cos
3	Brown	14	+Sin
4	Black	15	-Sin
13	Red / White (0.5mm²)	16	+Volts
14	Blue / White (0.5mm²)	17	0 Volts
Body	Screen	Body	Screen

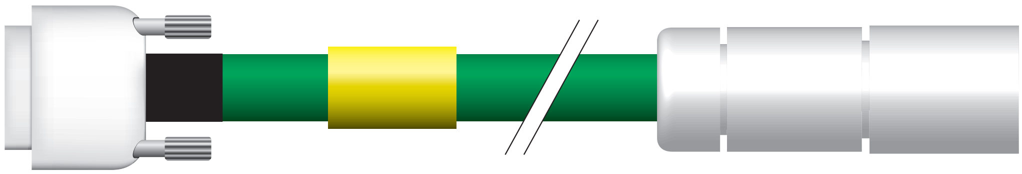
Signal cable SinCos SSBEHCxxx for SICK Encoders



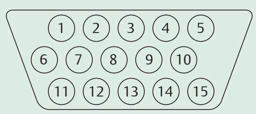
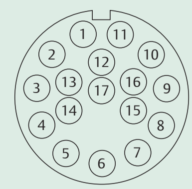
SinCos cable: SSBExxxxx, dia 10.9mm, maximum length 100m

15-way drive connections		12-way motor encoder plug	
			
Pin	**Colour**	**Pin**	**Function**
2	Red	1	REF Cos
5	Grey	2	+ Data
6	Pink	3	- Data
1	Blue	4	+ Cos
3	Purple	5	+Sin
4	Black	6	REF Sin
14	White	7	Thermistor
15	Brown	8	Thermistor
Body	Screen	9	Screen
14	Blue (1.0mm²)	10	0 Volts
	-	11	-
13	Red (1.0mm²)	12	+ V
Body	Screen	Body	Screen

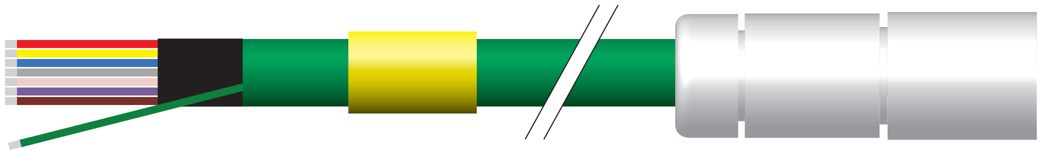
Signal cable SinCos SSBEHNxxx for Heidenhain Encoders



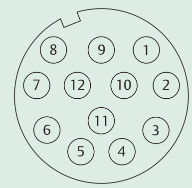
SinCos cable: SSBExxxxx, dia 10.9mm, maximum length 20m EC/FC, maximum length100m EB/FB

15-way drive connections		17-way motor encoder plug	
			
Pin	**Colour**	**Pin**	**Function**
14	White	1	Thermistor
15	Brown	2	Thermistor
Body	Orange or Black	3	Internal cable screen
7		4	
8		5	
9		6	
10		7	
11	Black	8	+Clock
12	Purple	9	-Clock
1	Grey / Pink	10	+Cos
5	White / Green	11	+Data
6	Brown / Green	12	-Data
2	Red / Blue	13	-Cos
3	Red (0.34mm²)	14	+Sin
4	Blue (0.34mm²)	15	-Sin
13	Red (1.0mm²)	16	+Volts
14	Blue (1.0mm²)	17	0 Volts
Body	Screen	Body	Screen

Signal cable Resolver SRBxBBxxx

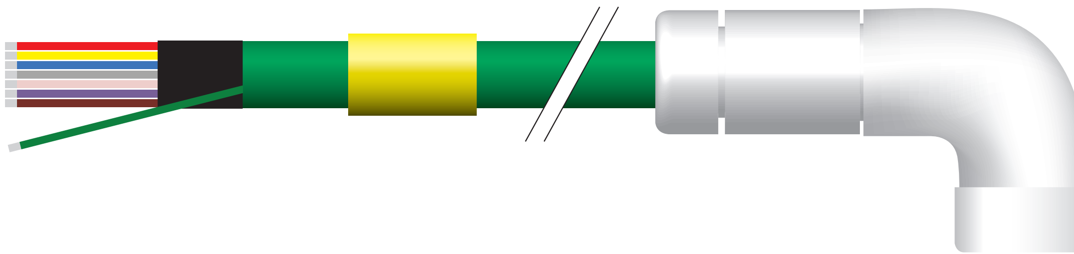


Resolver cable: SRBAxxxxx, dia 9.6mm, maximum length 100m

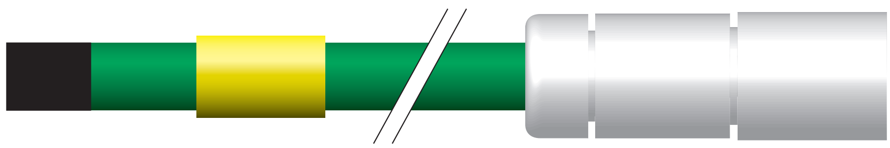
Drive connections		12-way motor encoder plug	
SM-Resolver			
Pin	**Colour**	**Pin**	**Function**
13	Red	1	Excitation high
14	Orange	2	Excitation low
11	Blue	3	Cos high
12	Violet	4	Cos low
10	Brown	5	Sin high
9	Black	6	Sin low
	Yellow	7	Thermistor
	Green	8	Thermistor
		9	
		10	
		11	
		12	
Body	Screen	Body	Screen

Other options of motor or drive connections are available. Below are some examples, or contact Control Techniques Dynamics Limited for details.

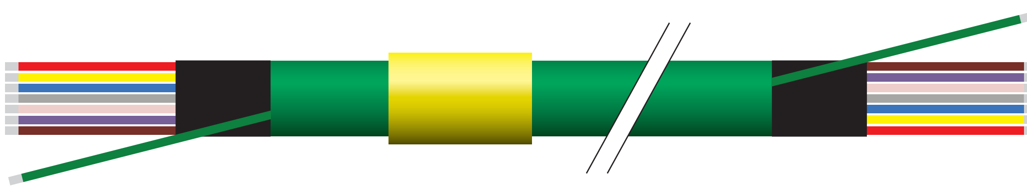
Right angle motor connectors



Cut end cables



UM terminal/hybrid box cables



5.5 Selecting connector kits

Control Techniques Dynamics can supply a full range of connectors for the Unimotor range. The tables below show the connector kits and spare sockets that are available.

Power connectors		
Single connector type	CTD connector part no	Spare sockets
Size 1 power (30A)	IM/0039/KI	IM/0047/KI
Size 1.5 power (4mm² cable : 53A)	IM/0053/KI	IM/0056/KI
Size 1.5 power (>6mm² cable : 70A)	IM/0054/KI	IM/0057/KI
Brake	-	IM/0048/KI

Signal connectors		
Single connector type	CTD connector part no	Spare sockets
Encoder/SinCos (Heidenhain)	IM/0022/KI	IM/0049/KI
Resolver/SinCos (SICK)	IM/0023/KI	IM/0049/KI
Resolver/SinCos(SICK) 90°	IM/0033KI/01	IM/0049/KI
Encoder/SinCos(Heidenhain) 90°	IM/0033/KI/02	IM/0049/KI

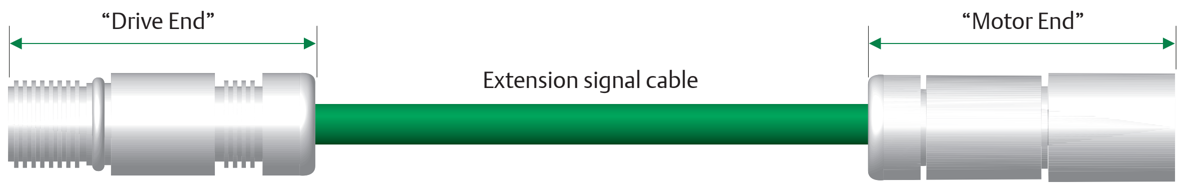
Power/signal type	CTD part no
Size 1 power + Encoder/SinCos (Heidenhain)	IM/0012/KI
Size 1 power + Resolver/SinCos (SICK)	IM/0011/KI

5.6 Unimotor signal and power extension cables

These cables are designed so that existing cables can be extended.

Signal cable

The signal extension cable uses a male contact version of the signal connector (Male plug) at the “Drive end” with the standard female contact version of the signal connector (Female socket) at the “Motor End”.



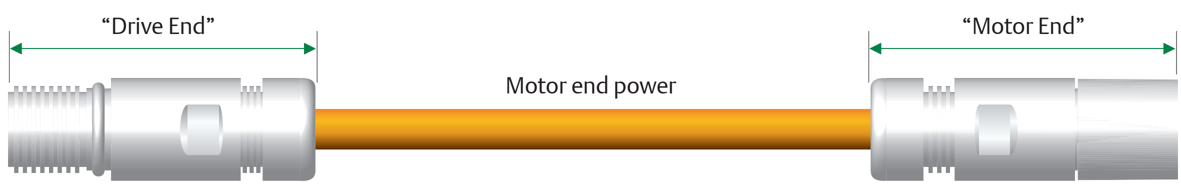
Male plug (Code **I**) Female socket (Code **A**, **B** or **C**)

Examples of the order codes for these cables are shown below:-

- ➜ SIBA**IA**003 (Incremental encoders)
- ➜ SRBA**IB**003 (Resolver)
- ➜ SSBA**IC**003 (SICK SinCos encoders)
- ➜ SSBA**IN**003 (Heidenhain Absolute encoders)

6 way Power cables

The Power extension cable has a male contact version of the power connector (Male plug) at the “Drive end”), with the standard female contact version of the power connector (Female plug) at the “Motor end”



6 way Male plug (Code **C**) 6 way Female socket (Code **A** or **B**)

Examples of the order codes for these cables are shown below:-

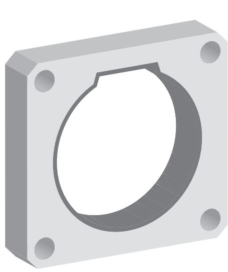
- ➜ PSBA**CA**003 (Unimotor size 055 to 142)
- ➜ PSBC**CB**003 (Unimotor size 190 to 250)

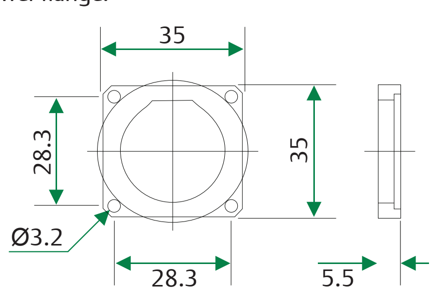
6 way Power cables

The Flange kits must be ordered separately under the following part numbers

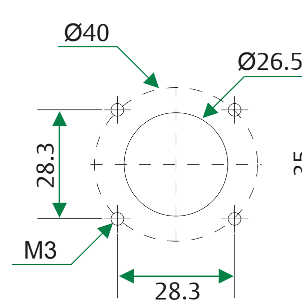
- ➜ Power size 1 Flange kit part number 1000301826
- ➜ Signal Flange kit part number 1000301825

See below for example of power flange.

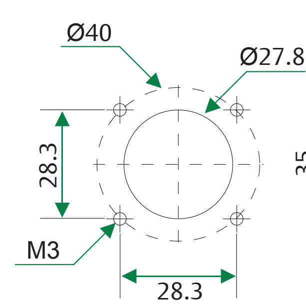




Flange



Panel hole detail - signal



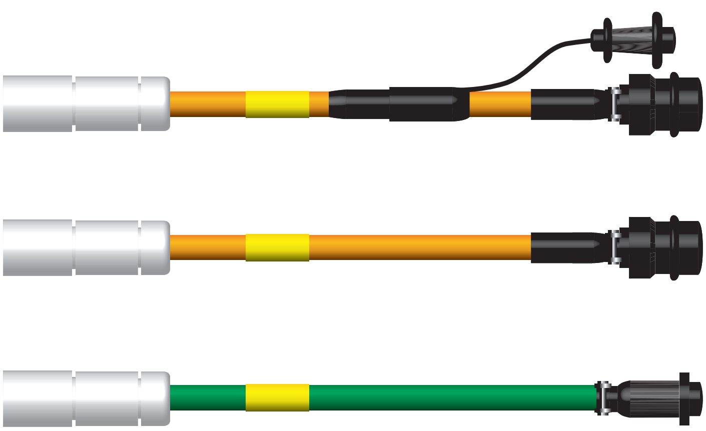
Panel hole detail - power

5.7 DS/MS conversion cables

Conversion cables will enable a Unimotor to be installed in an existing DS/MS application.

These cables are available in power (braked), power (un-braked) and signal (resolver). For part numbers see the table below.

Function	Motor	CTD Order code for Digitax drive	CTD Order code for Unidrive SP/ Digitax ST
Resolver	75 -142 DS to DM motor	SRBAZB	SRBAZB
Power UNBR	75 – 95 DS to DM motor	PSBGYA	PSBGYA-SOE
Power BRKD	75 – 95 DS to DM motor	PBBGYA	PBBGYA-SOE
Power UNBR	115 – 142 DS to DM motor	PSBAZA	PSBAZA-SOE
Power BRKD	115 – 142 DS to DM motor	PBBAZA	PBBAZA-SOE



The conversion cables will be a fixed length of 400mm and will not require the cable length as part of the order code.

The conductor size is fixed at 1.5mm for the 75-95 motors and 2.5mm for the 115-142 motors.

They are only available in the DESINA colours of Orange for power and Green for signal.

Below is a picture of the new conversion cables, power braked at the top then power un-braked then signal.

DutymAx DS/MS to Unimotor conversions

The DutymAx DS/MS range of motors was made obsolete during 2007 and to allow customers to swap out these motors the following information has been produced.

The old DigitAx and MaxAx drives and the Undrive classic/Unidrive SP drive have a different notation for the U and V power terminals which means that motors have to be wired in a certain way for a forward rotation on each drive.

The DutymAx DS motors were wired and setup for operation with the old DigitAx drive and the DutymAx MS motors were wired and setup for operation with the MaxAx drive.

The Unimotor UM, fm and hd motors are wired and setup for operation with the Unidrive classic and Unidrive SP drive.

DutymAx DS motors to Unimotor classic (DM)

To allow a Unimotor classic to be used with the DigitAx drive use a Unimotor DM motor and conversion cables for CTD motor codes DM/SQH. The resolver offset position will be set correctly.

75DSA300CAAAA ----- 75DMA300CAAAA

DutymAx DS motors to Unimotor fm (U2)

To allow a Unimotor U2 to be used with the DigitAx drive use conversion cables for CTD motor codes U2, and then the Unimotor U2 must be re auto tuned to a new zero offset position before running.

75DSA300CAAAA ----- 075U2A300CAAEA075110

DutymAx MS motors to Unimotor classic (-SQH)

To allow a Unimotor classic to be used with the MaxAx drive use a Special Unimotor classic

-SQH and conversion cables for CTD motor codes DM/SQH. The resolver offset position will be set correctly.

75MSA300CAAAA ----- 75EZA300CAAAA-SQH

DutymAx MS motors to Unimotor fm

Currently there is no Unimotor fm offering.

Note:

If a customer requires a replacement motor fitted with Hybrid box, to work with a DigitAx/MaxAx drive, the Unimotor DM/SQH will continue to be the recommended offering from CTDynamics. Unimotor fm does not have a hybrid box option.

The Unimotor DM/SQH does have a 125˚C rating so all resolver motor performances are rated the same as a DS/MS motor. Unimotor fm has a 100˚C rating so the performance will be reduced.

All front flange mounting dimensions and shaft dimensions remain the same for DS/MS and DM/SQH/U2 motors, but the motor length will vary.

Please check relevant brochure for details.

Conversion cables

(For conversion cable details see Tech Note CTD031101)

Function	CTD motor DS/MS	Conversion cables for CTD motor code DM/SQH	Conversion cables for CTD motor code U2
Resolver	75 -142	**SRBAZB**	SRBAZB
Power UNBR	75 – 95	**PSBGYA**	PSBGYA-SOE
Power BRKD	**75 – 95**	**PBBGYA**	PBBGYA-SOE
Power UNBR	115 – 142	**PSBAZA**	PSBAZA-SOE
Power BRKD	115 – 142	**PBBAZA**	PBBAZA-SOE

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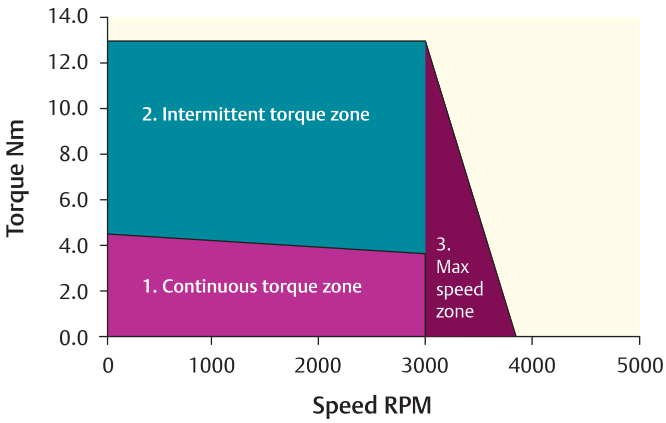
6 Performance graphs

The torque speed graph depicts the limits of operation for a given motor. The limits of operation are shown for three categories.

Torque/speed graph



1. Continuous or rms torque zone

This area gives the effective continuous or rms torque available for repetitive torque sequences. Continuous or rms torque must be within this area otherwise the motor may overheat and cause the system to trip out.

2. Intermittent or peak torque zone

Above the continuous zone is the intermittent zone where the motor may be safely operated for short periods of time. Operation within the intermittent zone is permissible provided that the defined peak torque limit is not exceeded. On some frame sizes the peak torque factor of 3 x stall current only applies up to a certain percentage level of rms current before it starts to reduce.
Please refer to the *Standard (2) peak torque* section for details.

Maximum peak torque is the upper limit of the intermittent zone and must never be exceeded, to do so will damage the motor.

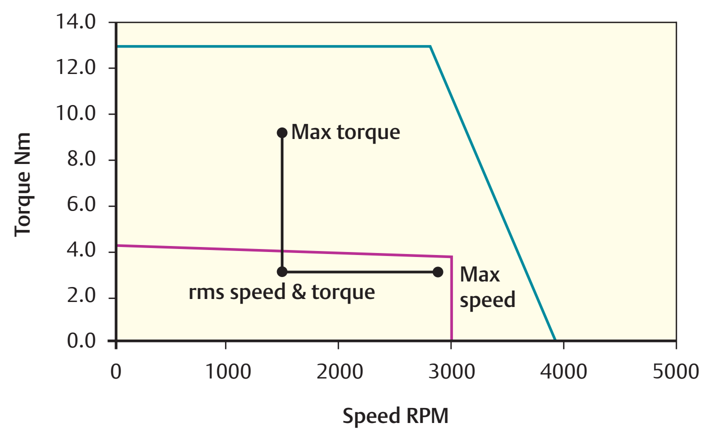
3. Maximum speed zone

To the right of the graph is a sloping line depicting the maximum motor speed when using a 200V/400V drive supply. The speed limit line is dependent upon the motor windings, and the voltage supplied to the drive. Operation within the maximum speed zone is permissible as long as the maximum speed limit is not exceeded. If the speed is increased beyond the limit shown, the motors sinusoidal waveform would have insufficient voltage and will clip and distort, causing inefficiency and higher temperature. If the distortion increases further, the drive may loose control of the motor and trip.

Plotting an operating point

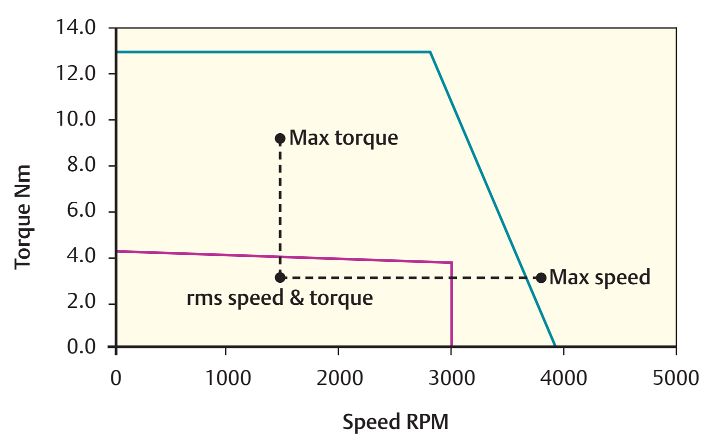
To estimate whether a motor is the correct choice for a given system, it is necessary to calculate or measure the rms torque and the rms speed for a given system in its normal continual stop/start sequenced mode. These operating points may be plotted on the torque speed graph. As shown in the first graph below, if the rms speed and torque point lies well within the continuous zone, then the motor is suitable for the application. The second graph below shows the max speed has increased to 3900rpm and this is now outside the safe area and another speed motor must be selected.

Torque/speed graph



Max torque =10Nm: Max speed = 2900 rms torque =3Nm: rms speed = 1500

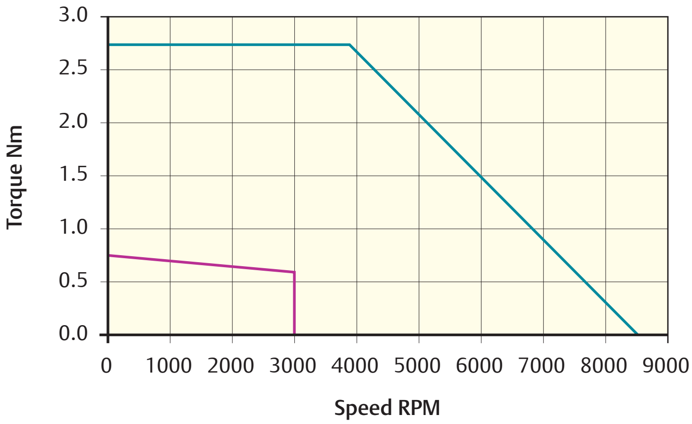
Torque/speed graph



Max torque =10Nm: Max speed = 3900 rms torque =3Nm: rms speed = 1500

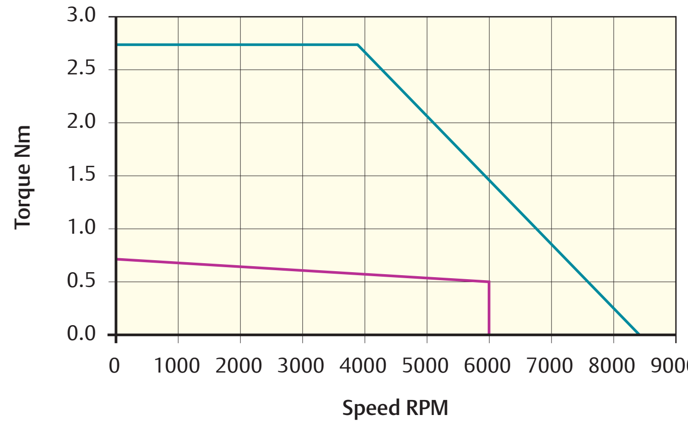
6.1 Unimotor fm

055U2A3000



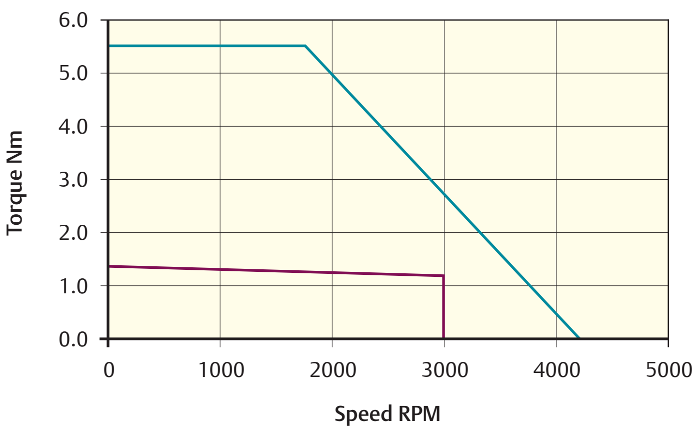
Peak torque (Nm) = **2.8** Stall torque (Nm) = **0.7** Rated torque (Nm) = **0.6**

055U2A6000



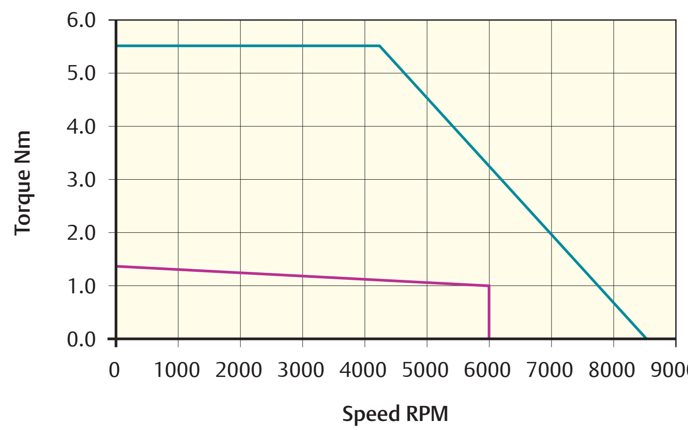
Peak torque (Nm) = **2.8** Stall torque (Nm) = **0.7** Rated torque (Nm) = **0.5**

055U2B3000



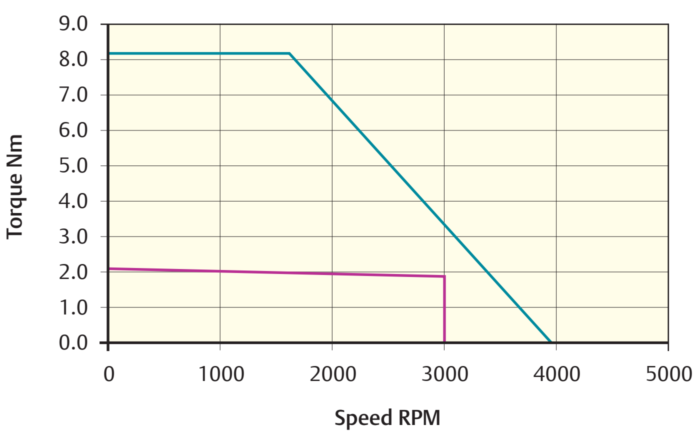
Peak torque (Nm) = **5.5** Stall torque (Nm) = **1.4** Rated torque (Nm) = **1.2**

055U2B6000



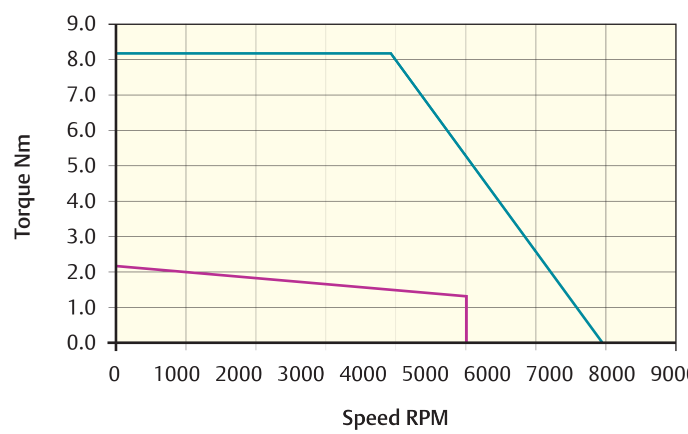
Peak torque (Nm) = **5.5** Stall torque (Nm) = **1.4** Rated torque (Nm) = **0.9**

055U2C3000



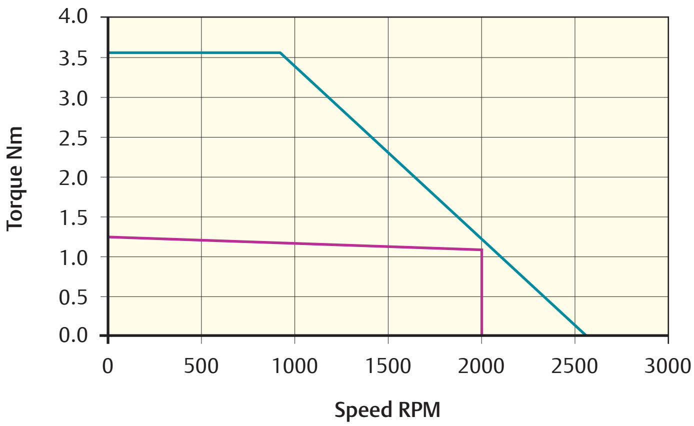
Peak torque (Nm) = **8.3** Stall torque (Nm) = **2.1** Rated torque (Nm) = **1.8**

055U2C6000



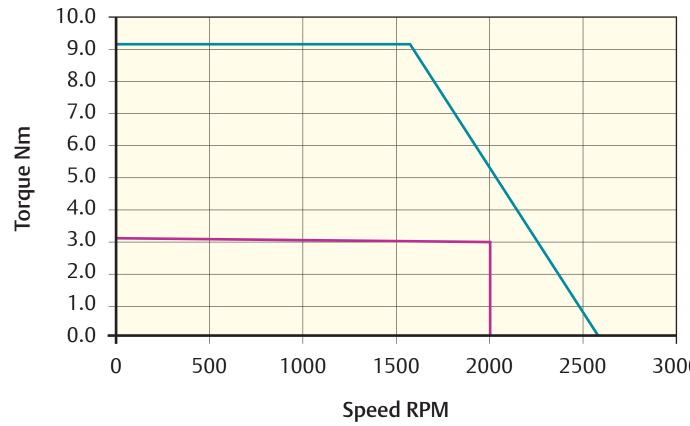
Peak torque (Nm) = **8.3** Stall torque (Nm) = **2.1** Rated torque (Nm) = **1.4**

075U2A2000



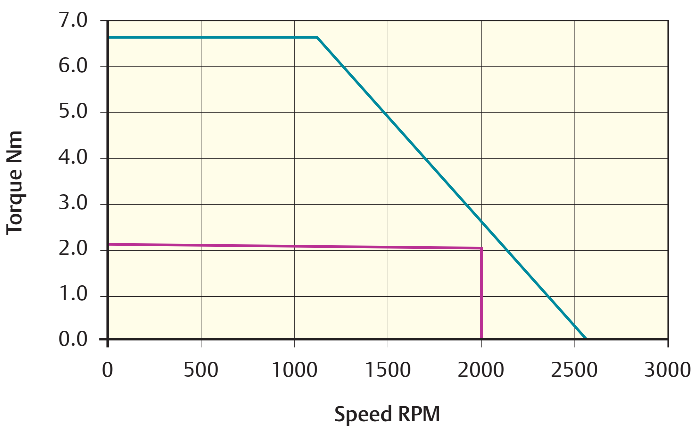
Peak torque (Nm) = **3.6** Stall torque (Nm) = **1.2** Rated torque (Nm) = **1.1**

075U2C2000



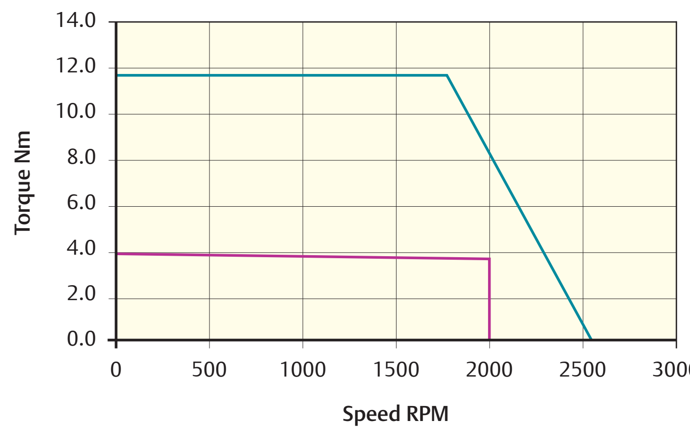
Peak torque (Nm) = **9.3** Stall torque (Nm) = **3.1** Rated torque (Nm) = **3.0**

075U2B2000



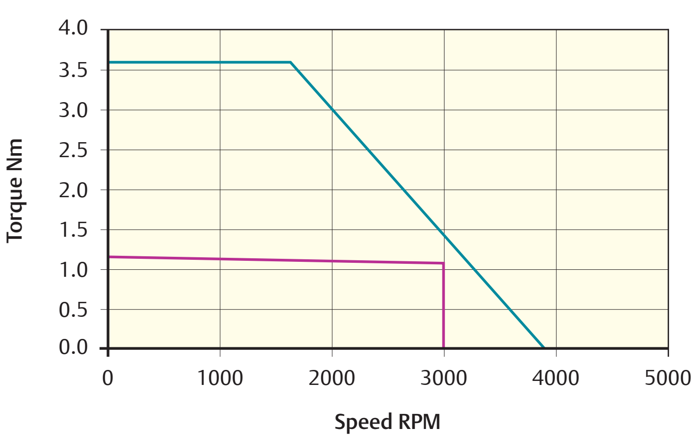
Peak torque (Nm) = **6.6** Stall torque (Nm) = **2.2** Rated torque (Nm) = **2.1**

075U2D2000



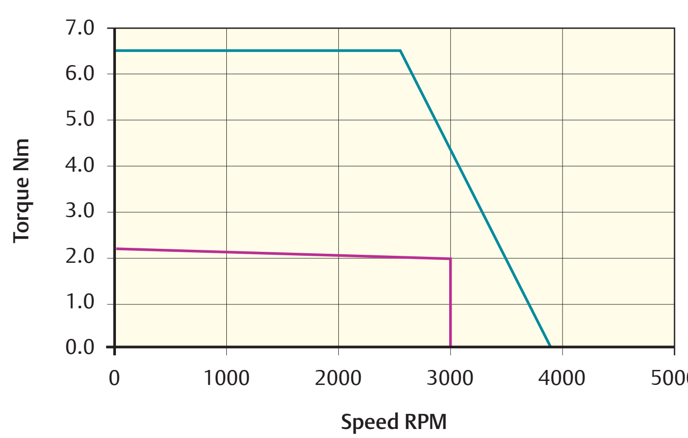
Peak torque (Nm) = **11.7** Stall torque (Nm) = **3.9** Rated torque (Nm) = **3.8**

075U2A3000



Peak torque (Nm) = **3.6** Stall torque (Nm) = **1.2** Rated torque (Nm) = **1.1**

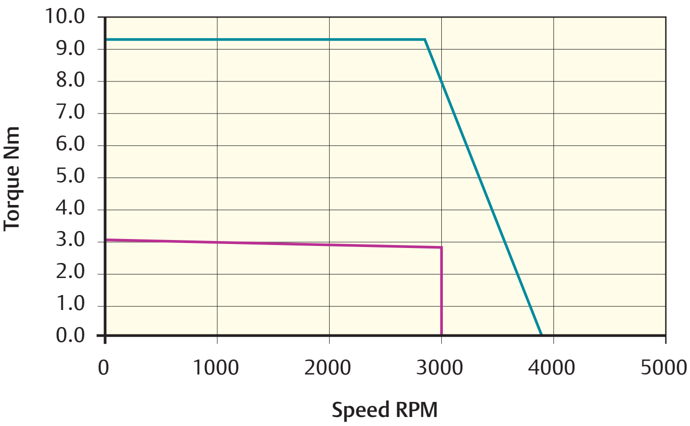
075U2B3000



Peak torque (Nm) = **6.6** Stall torque (Nm) = **2.2** Rated torque (Nm) = **2.0**

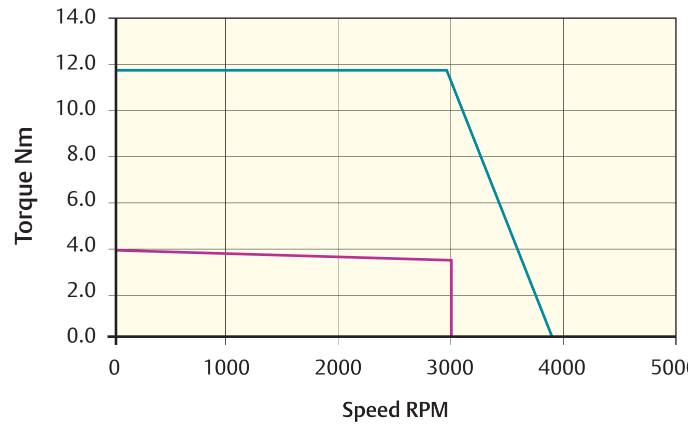
■ **Continuous zone** ■ **Intermittent zone** *All graphs are a 40°C ambient and 400V drive supply*

075U2C3000



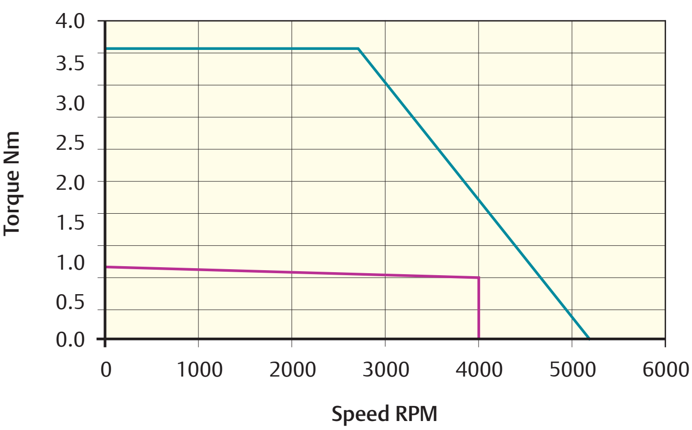
Peak torque (Nm) = **9.3** Stall torque (Nm) = **3.1** Rated torque (Nm) = **2.8**

075U2D3000



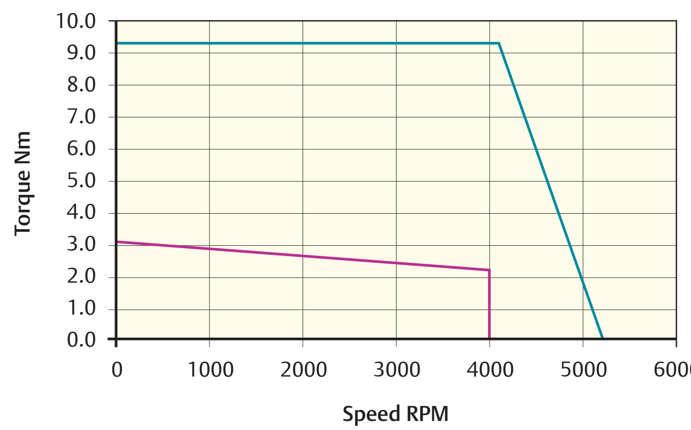
Peak torque (Nm) = **11.7** Stall torque (Nm) = **3.9** Rated torque (Nm) = **3.5**

075U2A4000



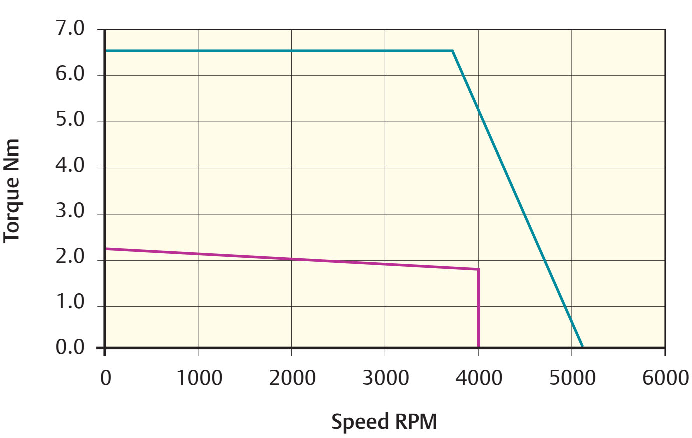
Peak torque (Nm) = **3.6** Stall torque (Nm) = **1.2** Rated torque (Nm) = **1.0**

075U2C4000



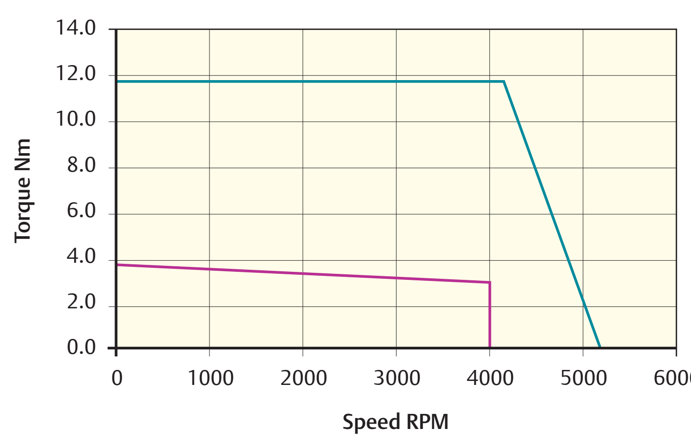
Peak torque (Nm) = **9.3** Stall torque (Nm) = **3.1** Rated torque (Nm) = **2.3**

075U2B4000



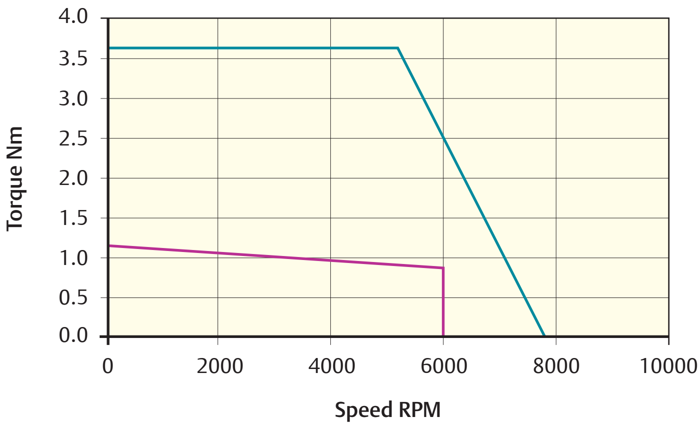
Peak torque (Nm) = **6.6** Stall torque (Nm) = **2.2** Rated torque (Nm) = **1.7**

075U2D4000



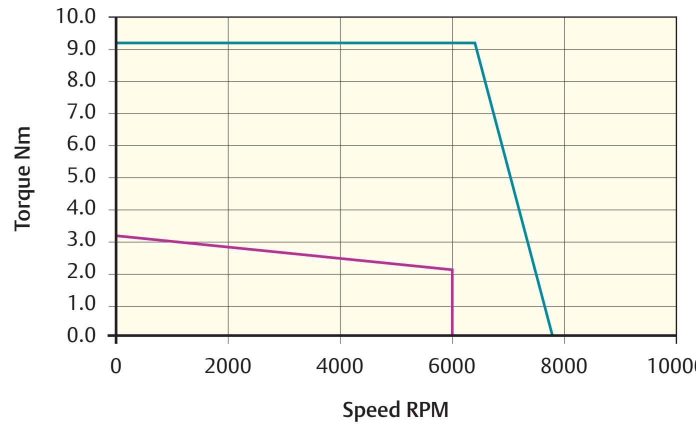
Peak torque (Nm) = **11.7** Stall torque (Nm) = **3.9** Rated torque (Nm) = **2.9**

075U2A6000



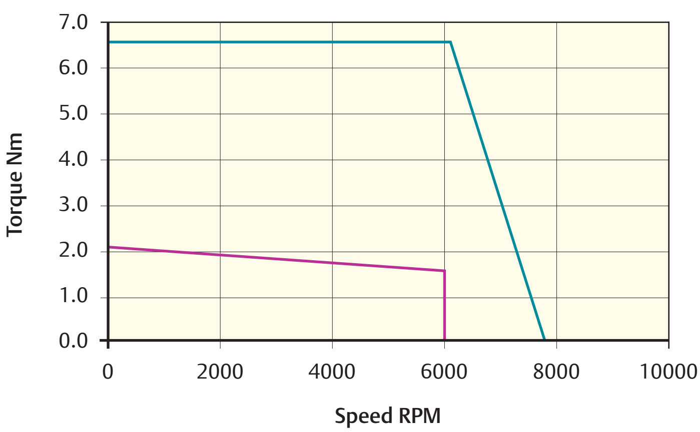
Peak torque (Nm) = **3.6** Stall torque (Nm) = **1.2** Rated torque (Nm) = **0.9**

075U2C6000



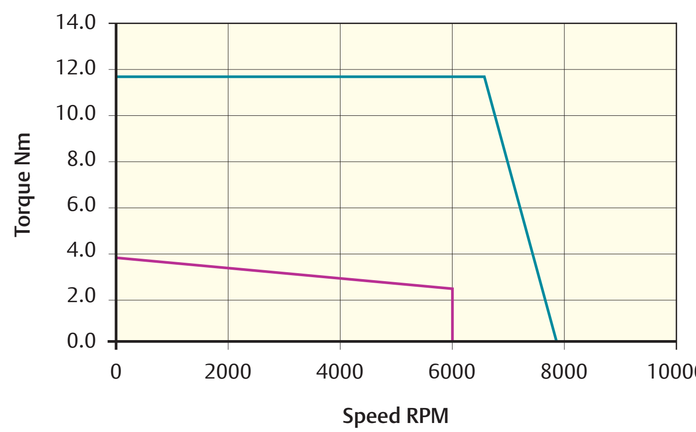
Peak torque (Nm) = **9.3** Stall torque (Nm) = **3.1** Rated torque (Nm) = **2.1**

075U2B6000



Peak torque (Nm) = **6.6** Stall torque (Nm) = **2.2** Rated torque (Nm) = **1.6**

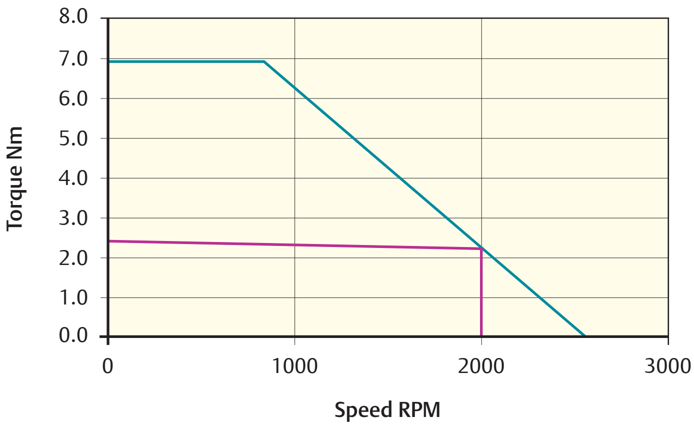
075U2D6000



Peak torque (Nm) = **11.7** Stall torque (Nm) = **3.9** Rated torque (Nm) = **2.6**

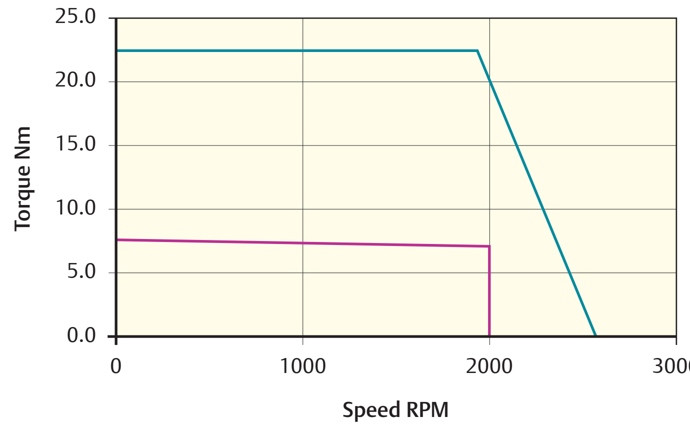
■ **Continuous zone** ■ **Intermittent zone** *All graphs are a 40°C ambient and 400V drive supply*

095U2A2000



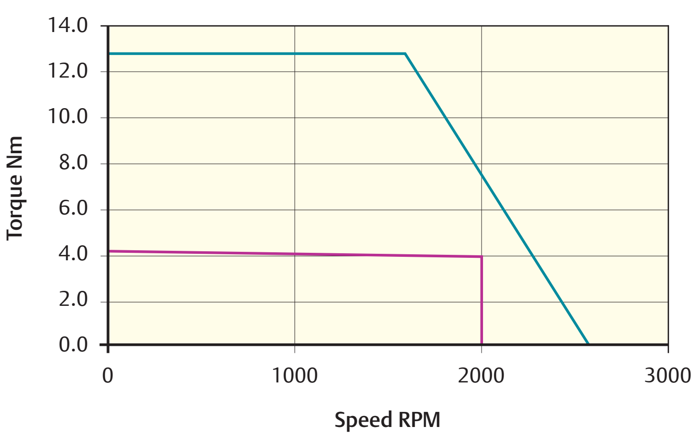
Peak torque (Nm) = **6.9** Stall torque (Nm) = **2.3** Rated torque (Nm) = **2.2**

095U2D2000



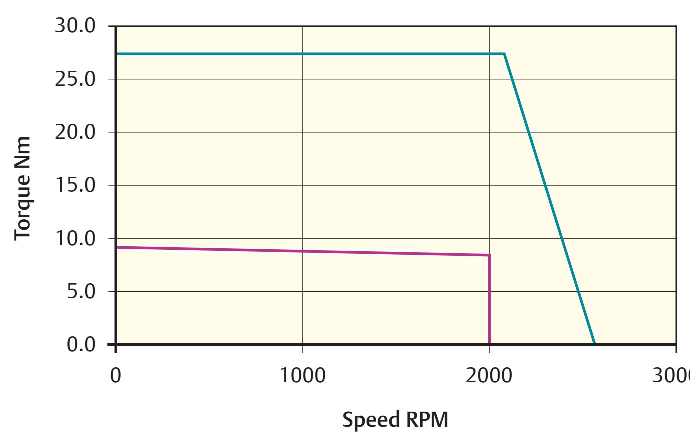
Peak torque (Nm) = **22.5** Stall torque (Nm) = **7.5** Rated torque (Nm) = **6.9**

095U2B2000



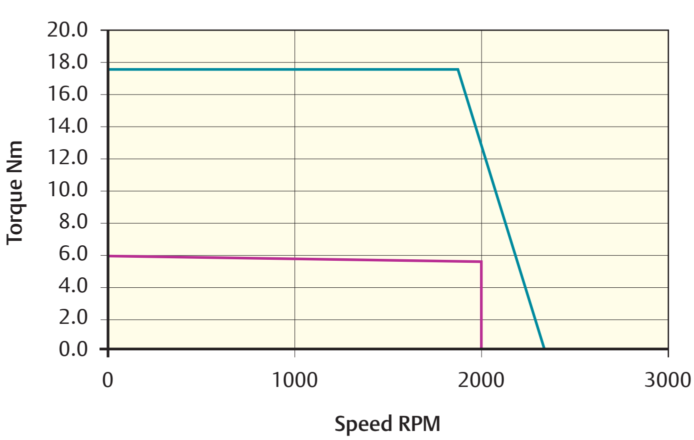
Peak torque (Nm) = **12.9** Stall torque (Nm) = **4.3** Rated torque (Nm) = **4.0**

095U2E2000



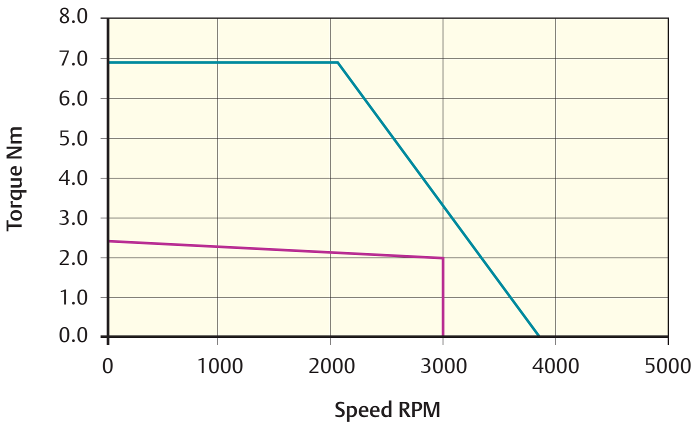
Peak torque (Nm) = **27.0** Stall torque (Nm) = **9.0** Rated torque (Nm) = **8.2**

095U2C2000



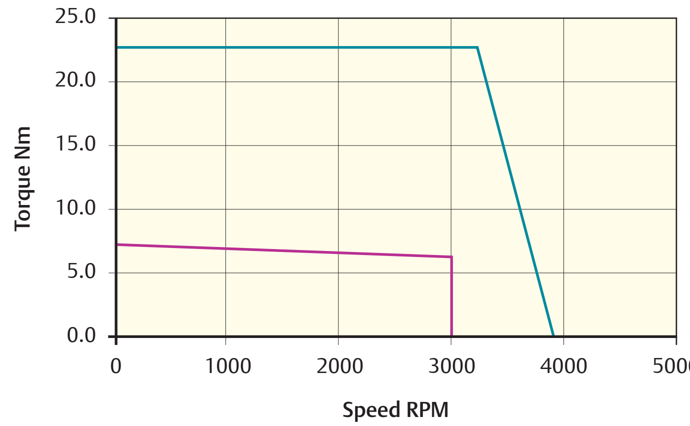
Peak torque (Nm) = **17.7** Stall torque (Nm) = **5.9** Rated torque (Nm) = **5.5**

095U2A3000



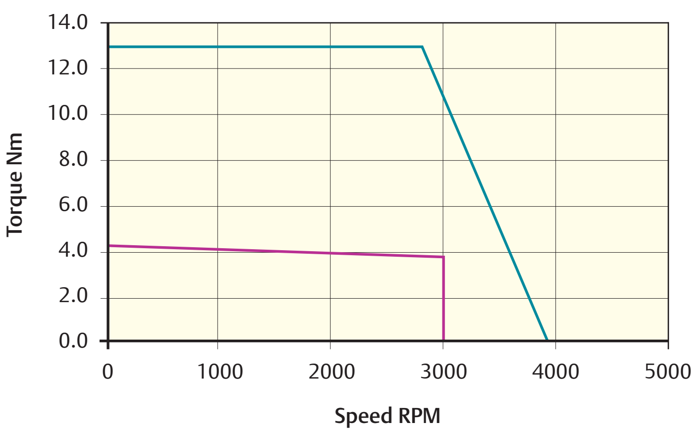
Peak torque (Nm) = **6.9** Stall torque (Nm) = **2.3** Rated torque (Nm) = **2.0**

095U2D3000



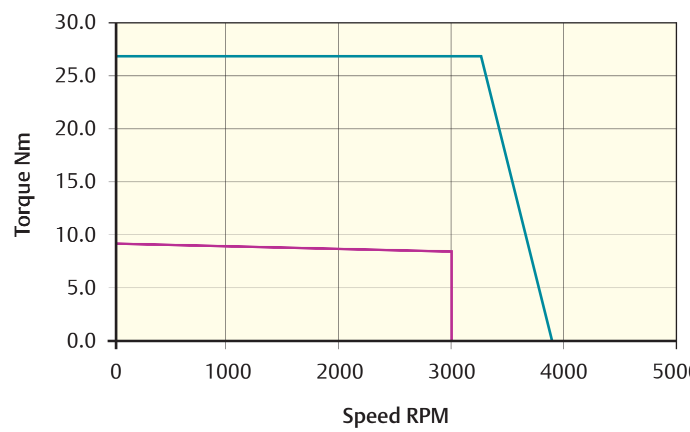
Peak torque (Nm) = **22.5** Stall torque (Nm) = **7.5** Rated torque (Nm) = **6.8**

095U2B3000



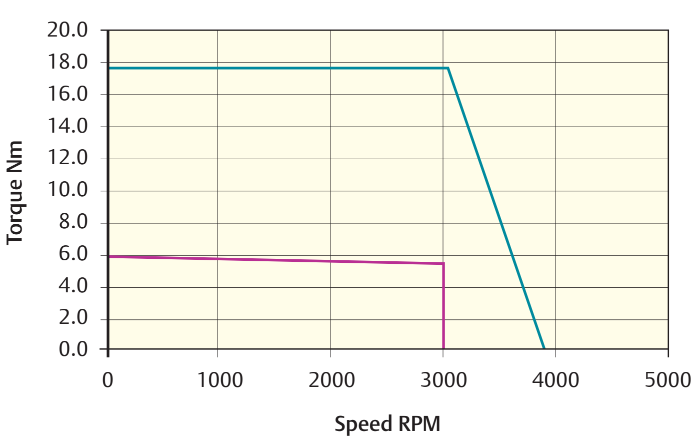
Peak torque (Nm) = **12.9** Stall torque (Nm) = **4.3** Rated torque (Nm) = **3.9**

095U2E3000



Peak torque (Nm) = **27.0** Stall torque (Nm) = **9.0** Rated torque (Nm) = **8.1**

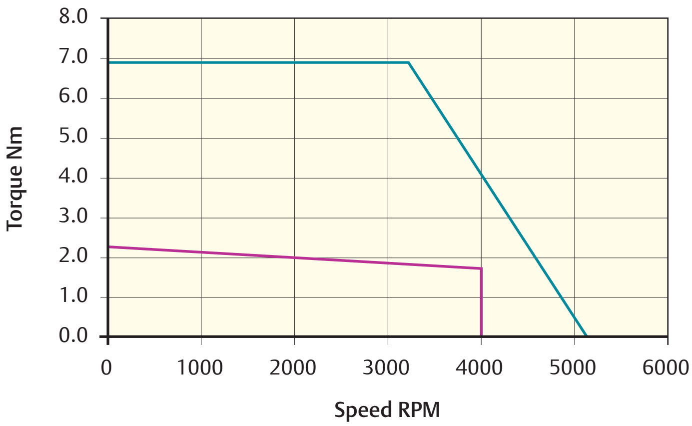
095U2C3000



Peak torque (Nm) = **17.7** Stall torque (Nm) = **5.9** Rated torque (Nm) = **5.4**

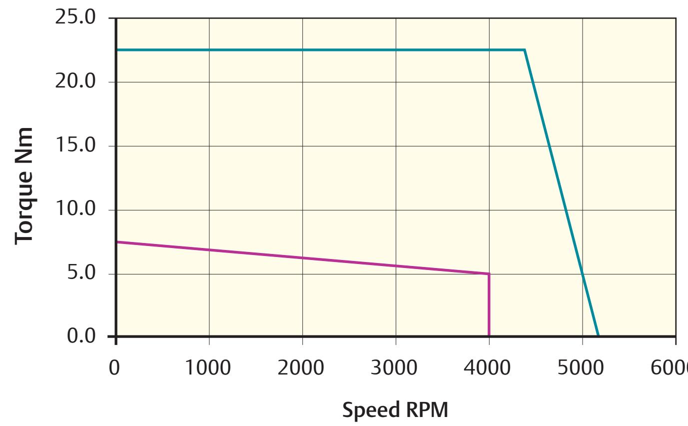
■ **Continuous zone** ■ **Intermittent zone** *All graphs are a 40°C ambient and 400V drive supply*

095U2A4000



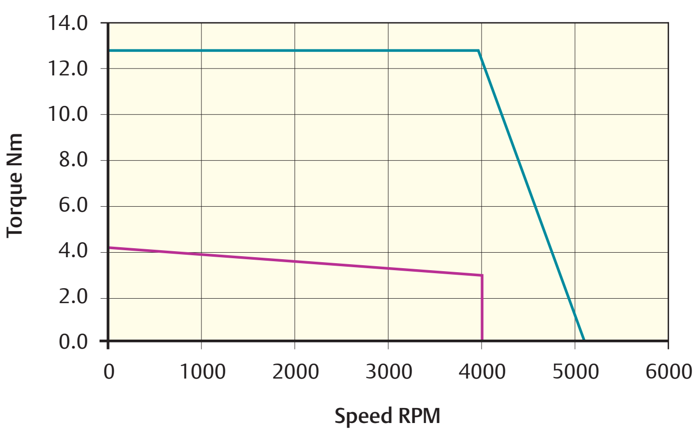
Peak torque (Nm) = **6.9** Stall torque (Nm) = **2.3** Rated torque (Nm) = **1.8**

095U2D4000



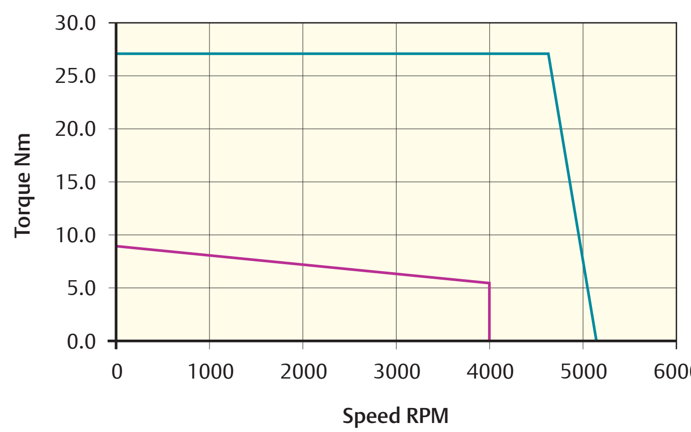
Peak torque (Nm) = **22.5** Stall torque (Nm) = **7.5** Rated torque (Nm) = **4.9**

095U2B4000



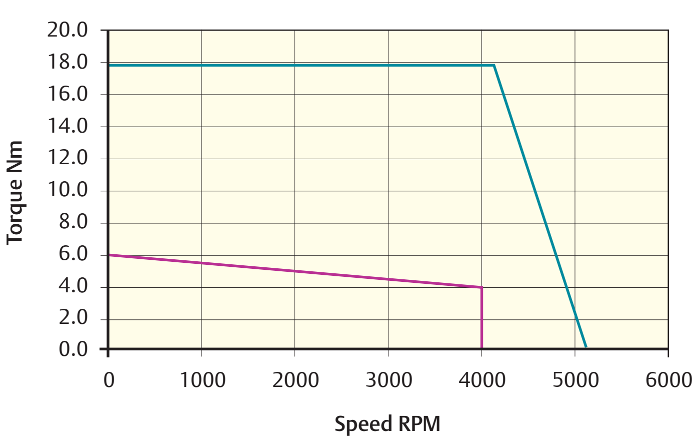
Peak torque (Nm) = **12.9** Stall torque (Nm) = **4.3** Rated torque (Nm) = **3.0**

095U2E4000



Peak torque (Nm) = **27.0** Stall torque (Nm) = **9.0** Rated torque (Nm) = **5.7**

095U2C4000



Peak torque (Nm) = **17.7** Stall torque (Nm) = **5.9** Rated torque (Nm) = **4.0**

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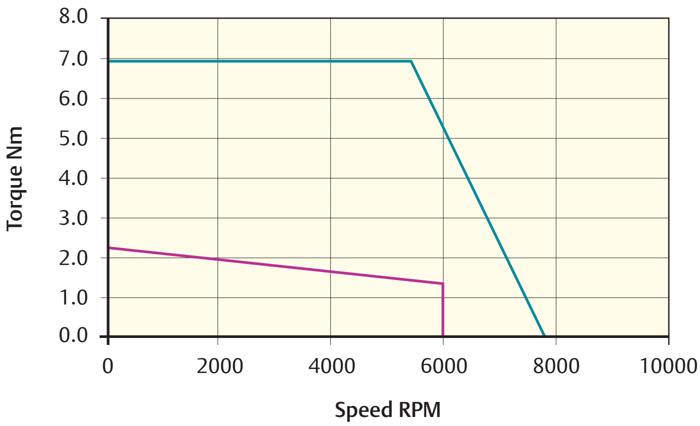
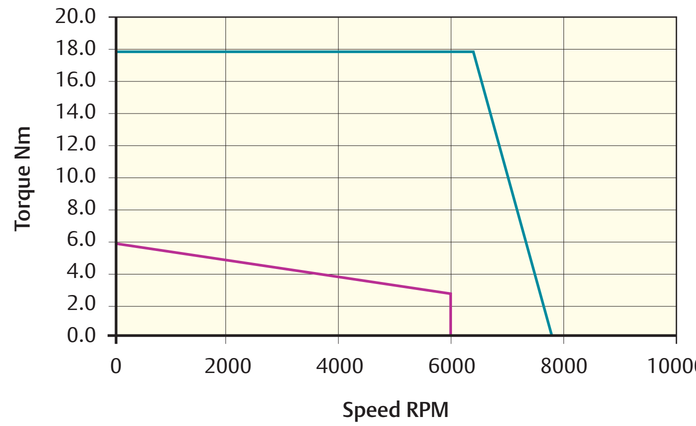
095U2A6000



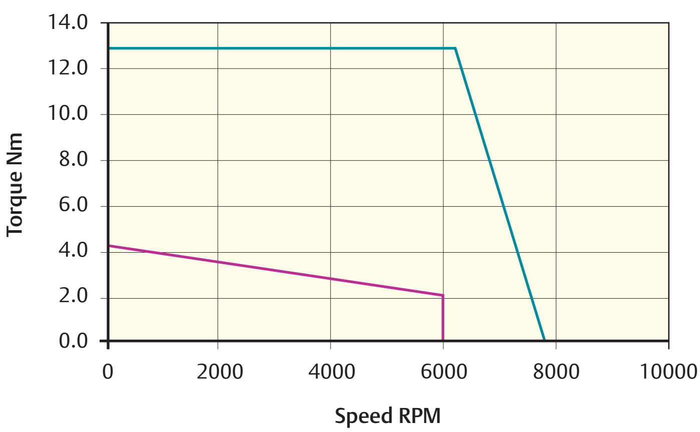
Peak torque (Nm) = **6.9** Stall torque (Nm) = **2.3** Rated torque (Nm) = **1.3**

095U2C6000



Peak torque (Nm) = **17.7** Stall torque (Nm) = **5.9** Rated torque (Nm) = **2.8**

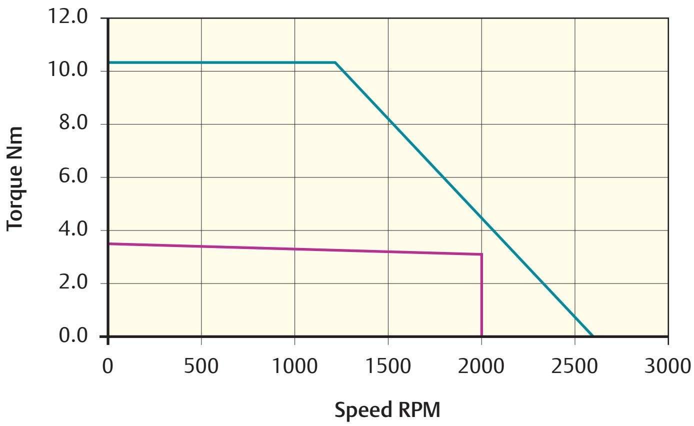
095U2B6000



Peak torque (Nm) = **12.9** Stall torque (Nm) = **4.3** Rated torque (Nm) = **2.1**

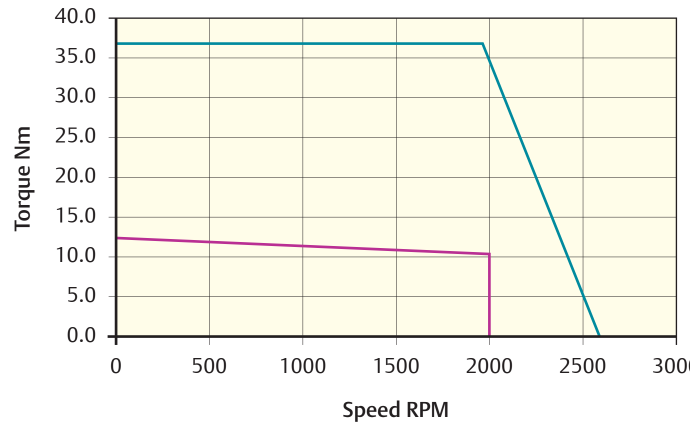
■ **Continuous zone** ■ **Intermittent zone** *All graphs are a 40°C ambient and 400V drive supply*

115U2A2000



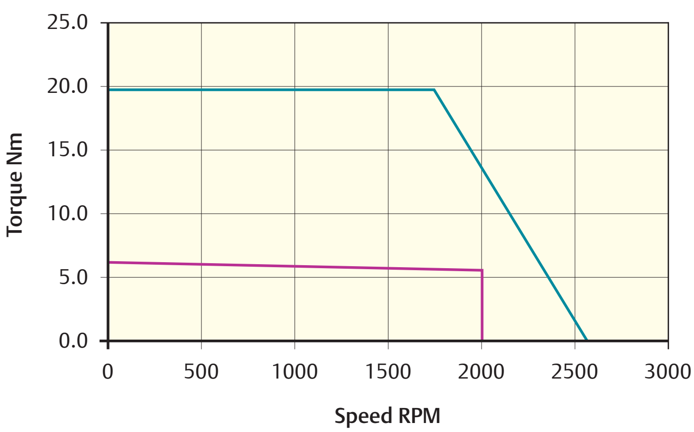
Peak torque (Nm) = **10.5**   Stall torque (Nm) = **3.5**   Rated torque (Nm) = **3.2**

115U2D2000



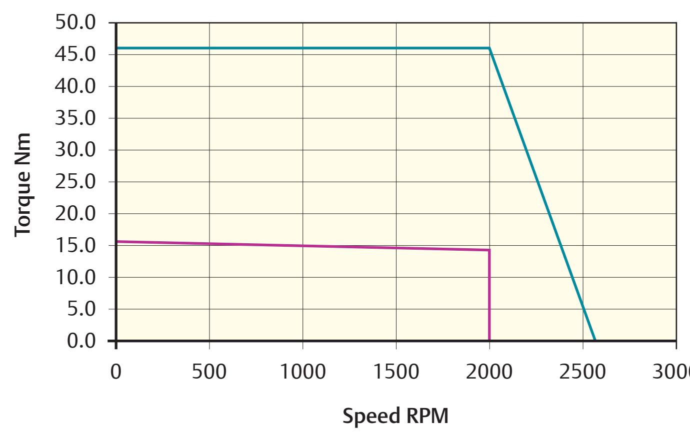
Peak torque (Nm) = **37.2**   Stall torque (Nm) = **12.4**   Rated torque (Nm) = **10.8**

115U2B2000



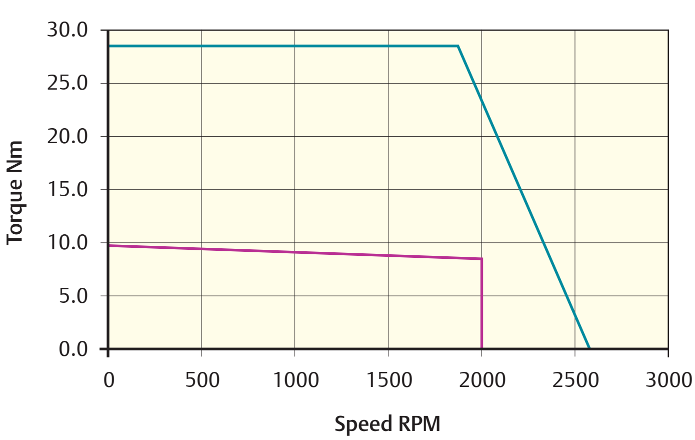
Peak torque (Nm) = **19.8**   Stall torque (Nm) = **6.6**   Rated torque (Nm) = **6.1**

115U2E2000



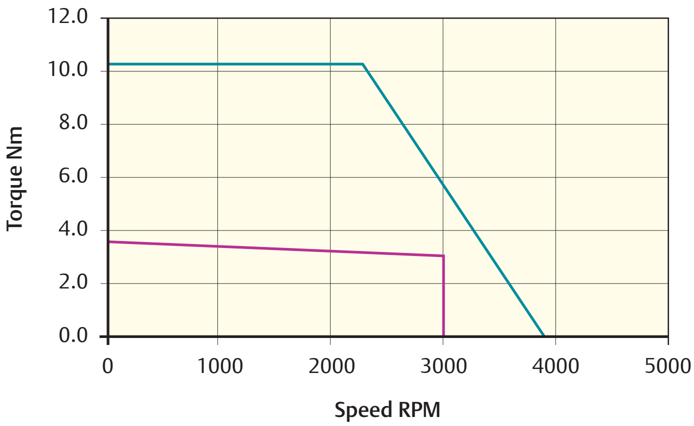
Peak torque (Nm) = **45.9**   Stall torque (Nm) = **15.3**   Rated torque (Nm) = **14.0**

115U2C2000



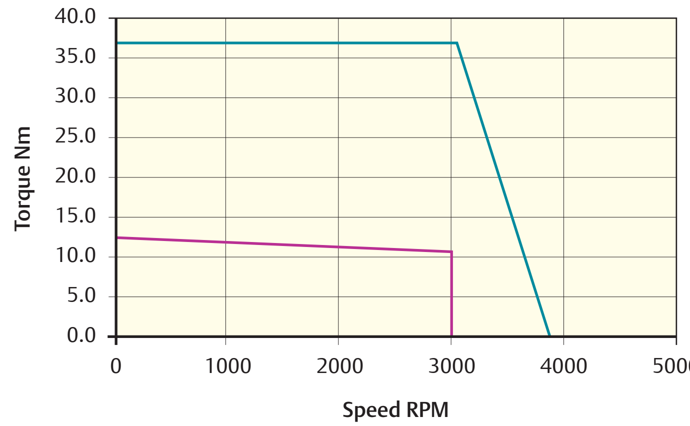
Peak torque (Nm) = **28.2**   Stall torque (Nm) = **9.4**   Rated torque (Nm) = **8.7**

115U2A3000



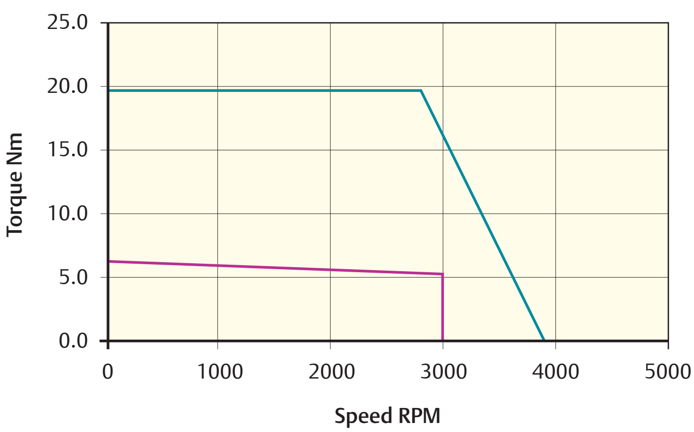
Peak torque (Nm) = **10.5** Stall torque (Nm) = **3.5** Rated torque (Nm) = **3.0**

115U2D3000



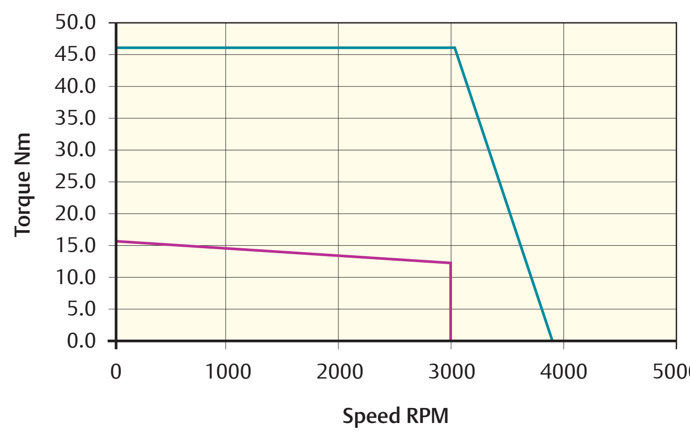
Peak torque (Nm) = **37.4** Stall torque (Nm) = **12.4** Rated torque (Nm) = **10.4**

115U2B3000



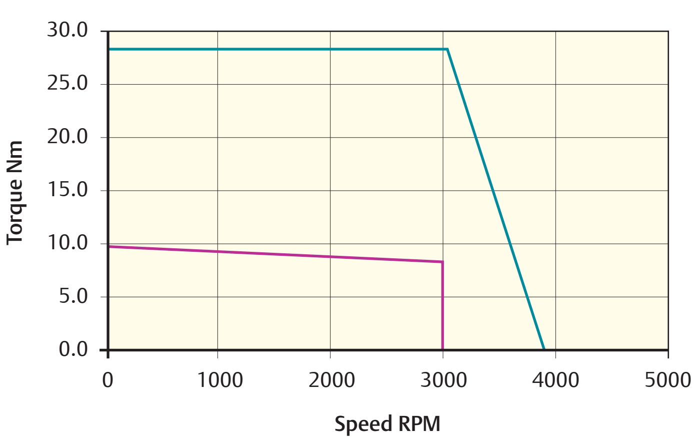
Peak torque (Nm) = **19.8** Stall torque (Nm) = **6.6** Rated torque (Nm) = **5.5**

115U2E3000



Peak torque (Nm) = **45.9** Stall torque (Nm) = **15.3** Rated torque (Nm) = **12.6**

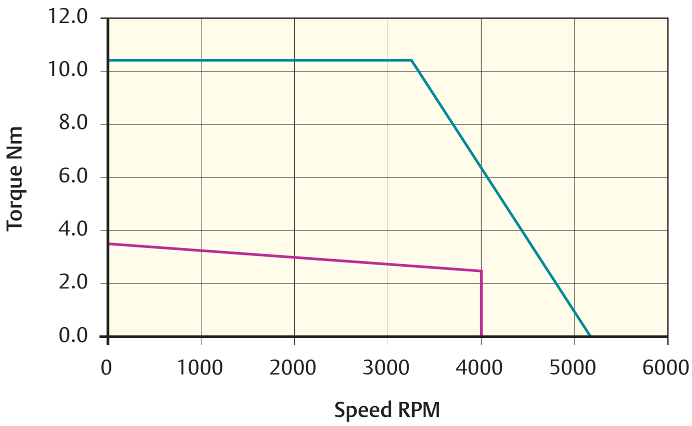
115U2C3000



Peak torque (Nm) = **28.2** Stall torque (Nm) = **9.4** Rated torque (Nm) = **8.1**

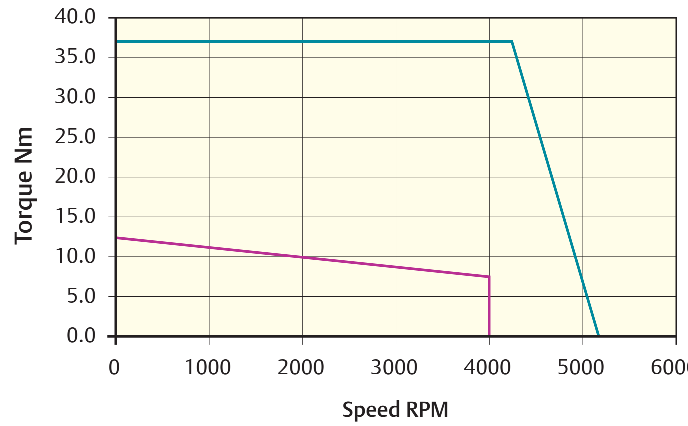
Continuous zone **Intermittent zone** *All graphs are a 40°C ambient and 400V drive supply*

115U2A4000



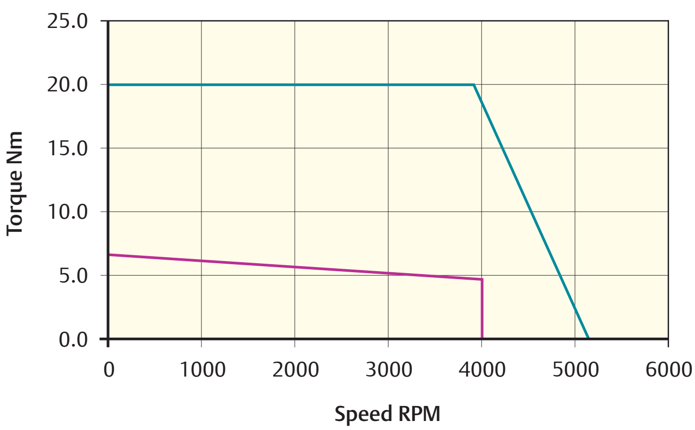
Peak torque (Nm) = **10.5** Stall torque (Nm) = **3.5** Rated torque (Nm) = **2.5**

115U2D4000



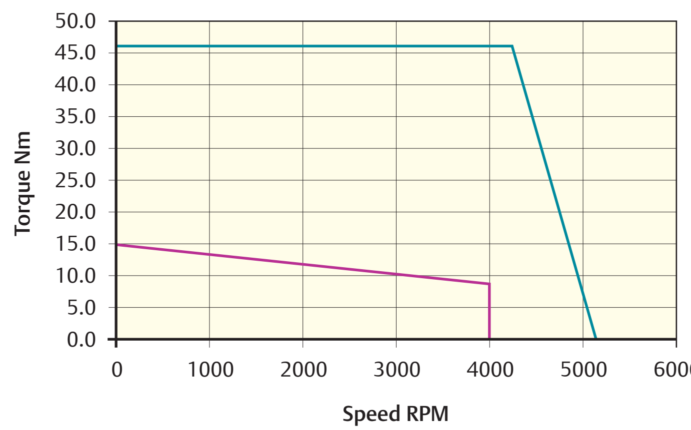
Peak torque (Nm) = **37.2** Stall torque (Nm) = **12.4** Rated torque (Nm) = **7.5**

115U2B4000



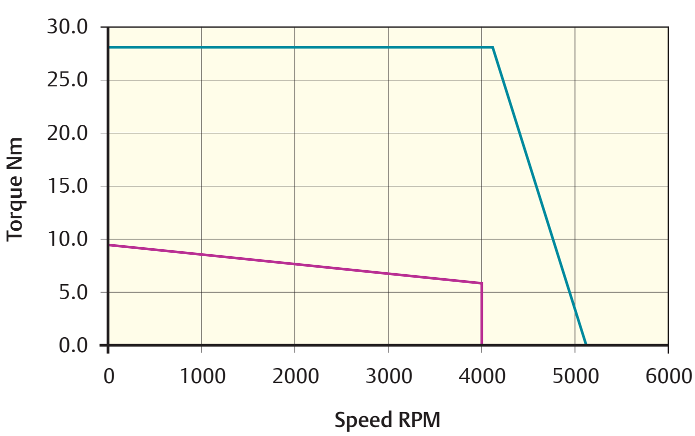
Peak torque (Nm) = **19.8** Stall torque (Nm) = **6.6** Rated torque (Nm) = **4.7**

115U2E4000



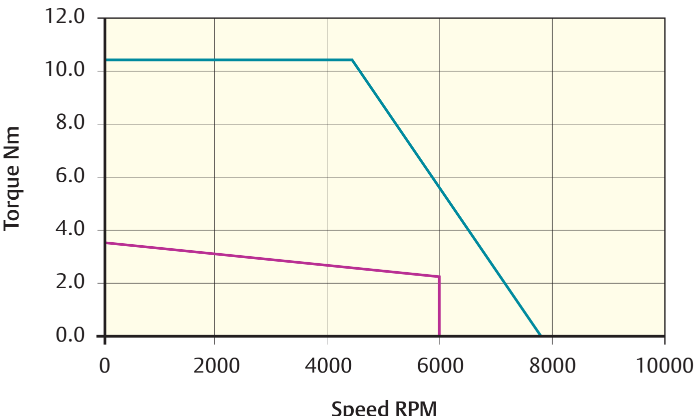
Peak torque (Nm) = **45.9** Stall torque (Nm) = **15.3** Rated torque (Nm) = **8.7**

115U2C4000



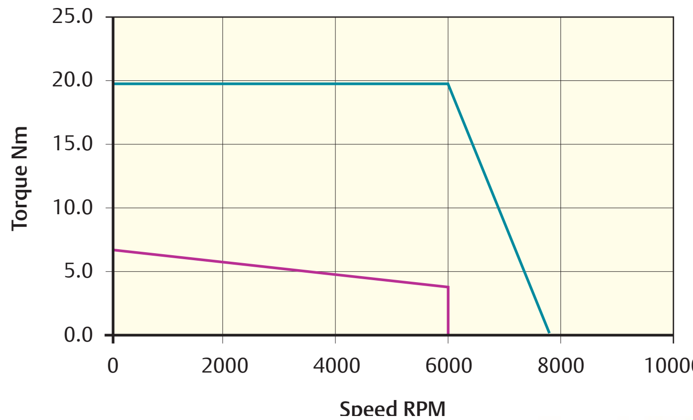
Peak torque (Nm) = **28.2** Stall torque (Nm) = **9.4** Rated torque (Nm) = **6.3**

115U2A6000



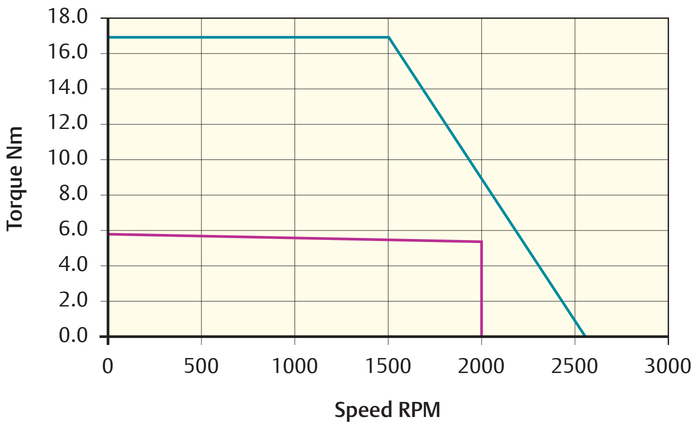
Peak torque (Nm) = **10.5** Stall torque (Nm) = **3.5** Rated torque (Nm) = **2.2**

115U2B6000



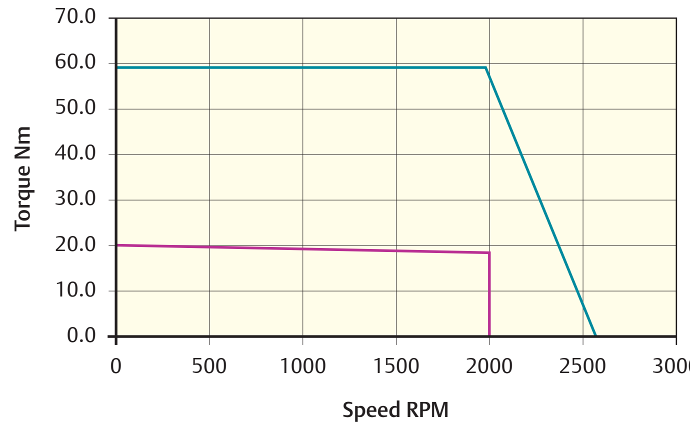
Peak torque (Nm) = **19.8** Stall torque (Nm) = **6.6** Rated torque (Nm) = **4.0**

142U2A2000



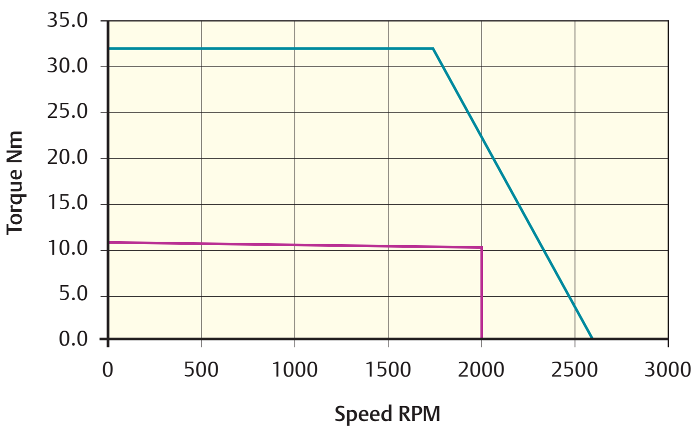
Peak torque (Nm) = **17.1** Stall torque (Nm) = **5.7** Rated torque (Nm) = **5.3**

142U2D2000



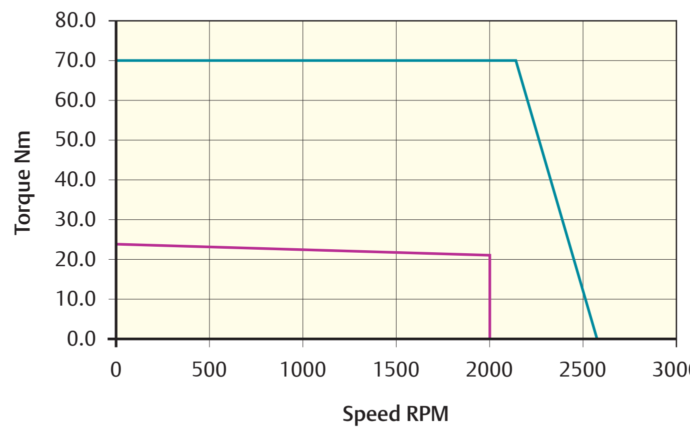
Peak torque (Nm) = **59.4** Stall torque (Nm) = **19.8** Rated torque (Nm) = **18.4**

142U2B2000



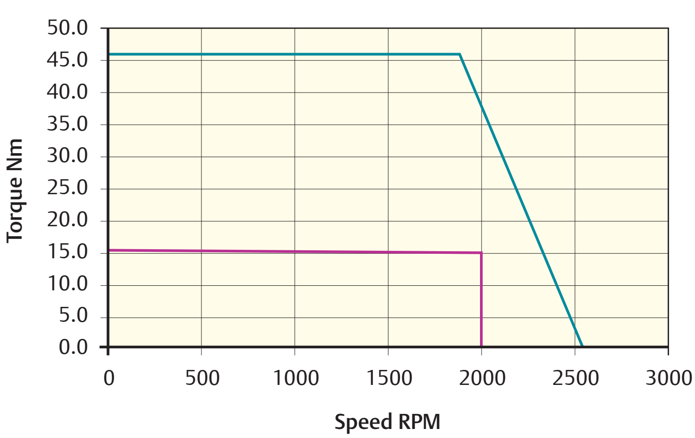
Peak torque (Nm) = **32.4** Stall torque (Nm) = **10.8** Rated torque (Nm) = **10.3**

142U2E2000



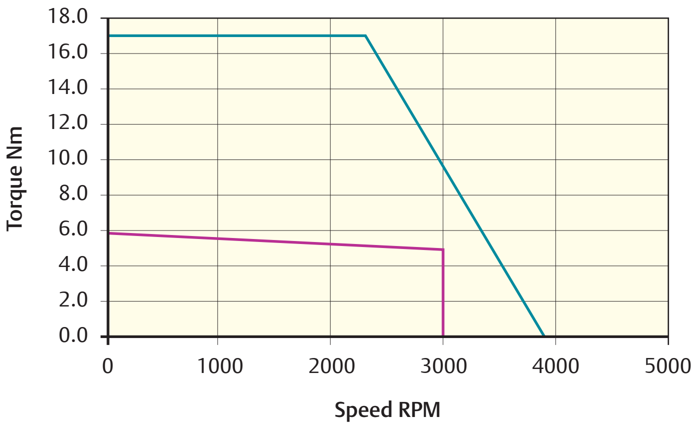
Peak torque (Nm) = **70.4** Stall torque (Nm) = **23.4** Rated torque (Nm) = **21.3**

142U2C2000



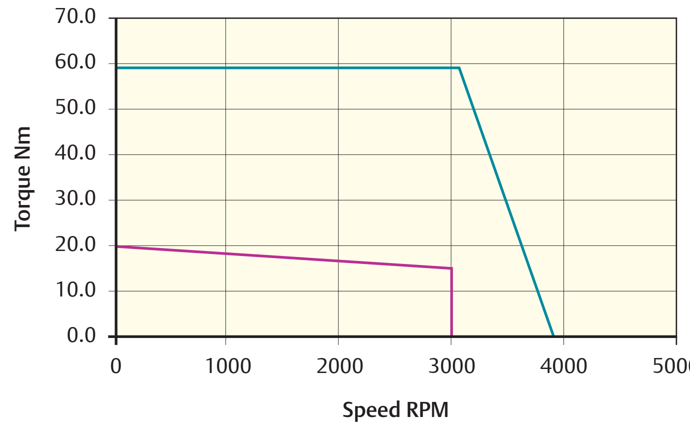
Peak torque (Nm) = **45.9** Stall torque (Nm) = **15.3** Rated torque (Nm) = **14.6**

142U2A3000



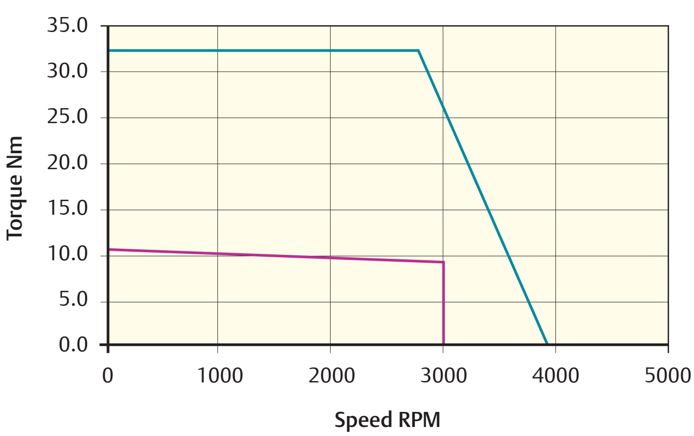
Peak torque (Nm) = **17.1** Stall torque (Nm) = **5.7** Rated torque (Nm) = **4.9**

142U2D3000



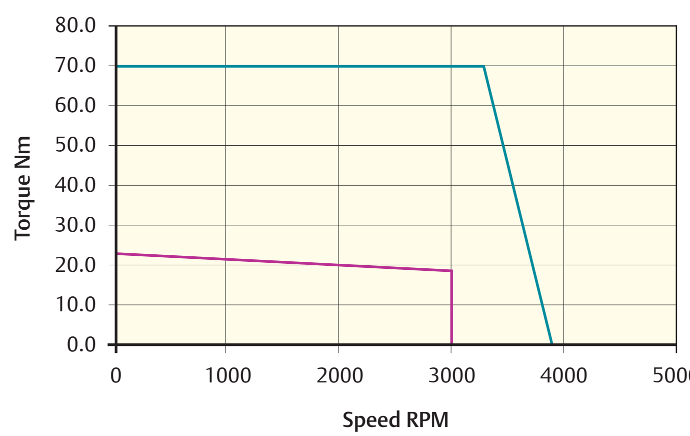
Peak torque (Nm) = **59.4** Stall torque (Nm) = **19.8** Rated torque (Nm) = **15.8**

142U2B3000



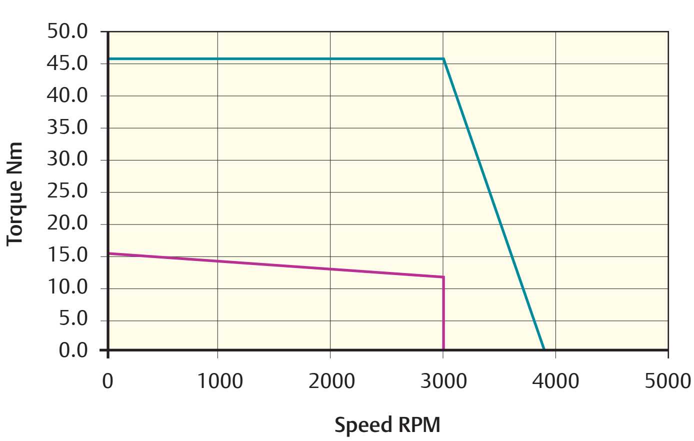
Peak torque (Nm) = **32.4** Stall torque (Nm) = **10.8** Rated torque (Nm) = **9.0**

142U2E3000



Peak torque (Nm) = **70.2** Stall torque (Nm) = **23.4** Rated torque (Nm) = **18.0**

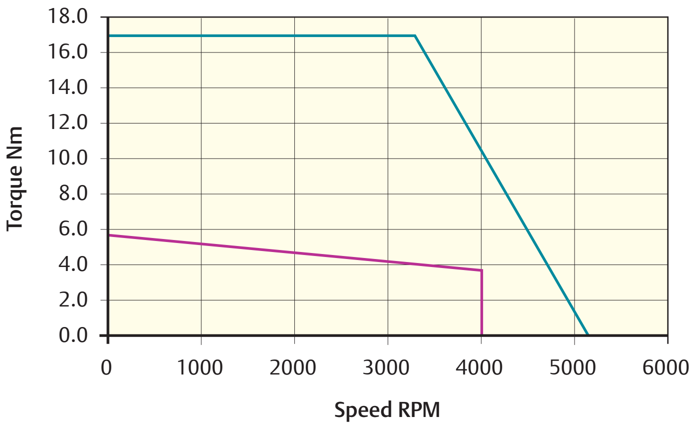
142U2C3000



Peak torque (Nm) = **45.9** Stall torque (Nm) = **15.3** Rated torque (Nm) = **12.2**

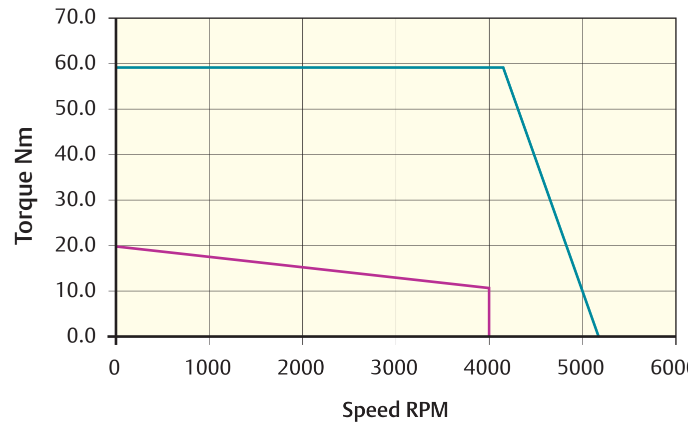
■ **Continuous zone** ■ **Intermittent zone** *All graphs are a 40°C ambient and 400V drive supply*

142U2A4000



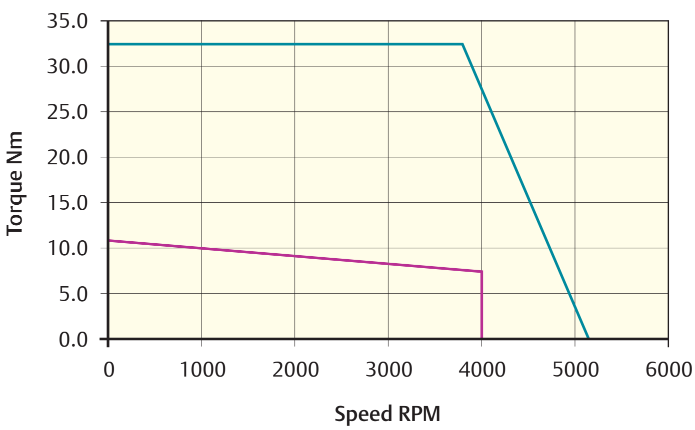
Peak torque (Nm) = **17.1**   Stall torque (Nm) = **5.7**   Rated torque (Nm) = **3.6**

142U2D4000



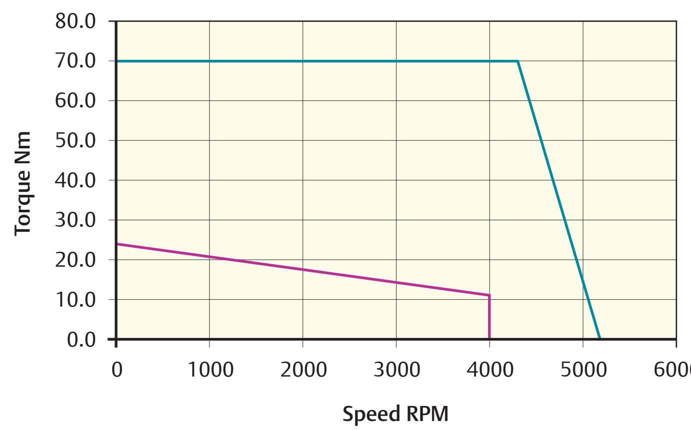
Peak torque (Nm) = **59.4**   Stall torque (Nm) = **19.8**   Rated torque (Nm) = **10.7**

142U2B4000



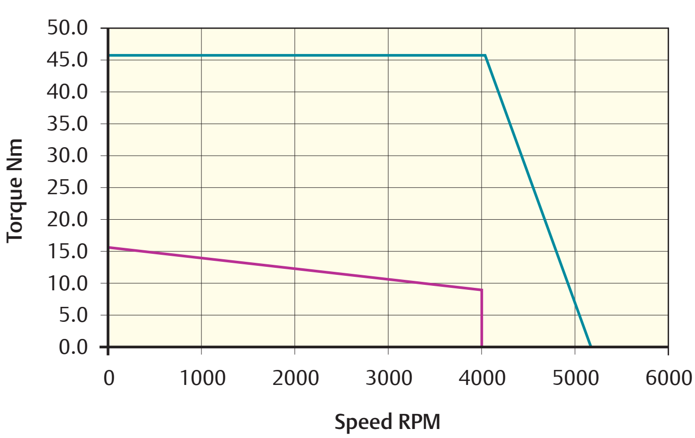
Peak torque (Nm) = **32.4**   Stall torque (Nm) = **10.8**   Rated torque (Nm) = **7.0**

142U2E4000



Peak torque (Nm) = **70.2**   Stall torque (Nm) = **23.4**   Rated torque (Nm) = **12.2**

142U2C4000



Peak torque (Nm) = **45.9**   Stall torque (Nm) = **15.3**   Rated torque (Nm) = **8.9**

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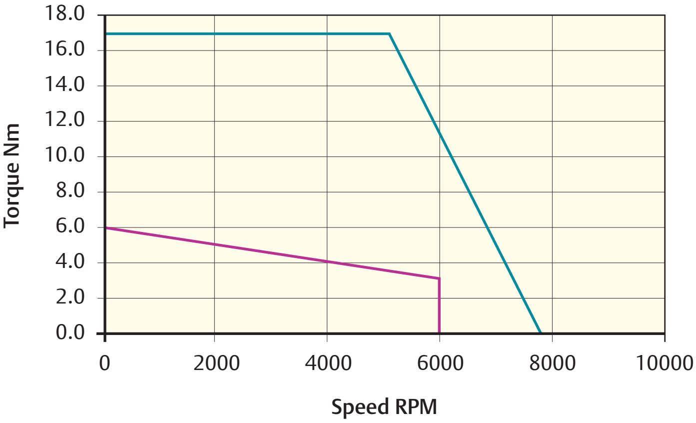
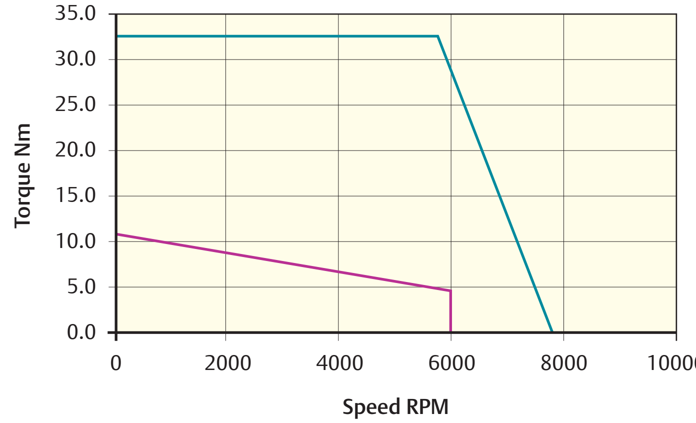
142U2A6000



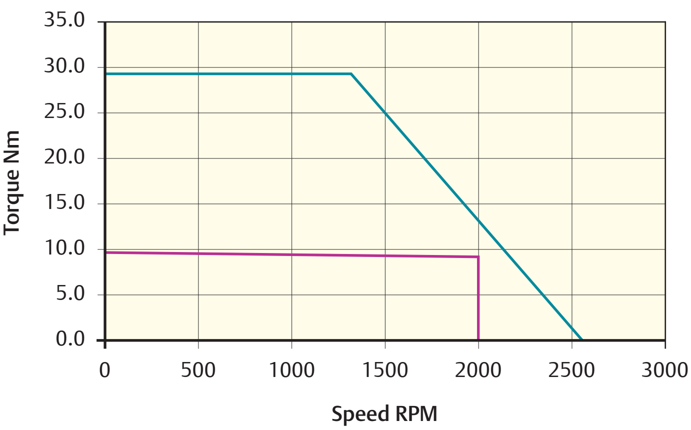
Peak torque (Nm) = **17.1** Stall torque (Nm) = **5.7** Rated torque (Nm) = **2.9**

142U2B6000



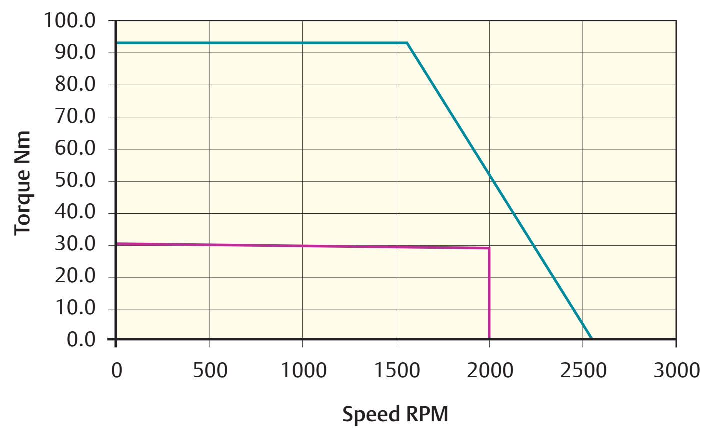
Peak torque (Nm) = **32.4** Stall torque (Nm) = **10.8** Rated torque (Nm) = **4.5**

190U2A2000



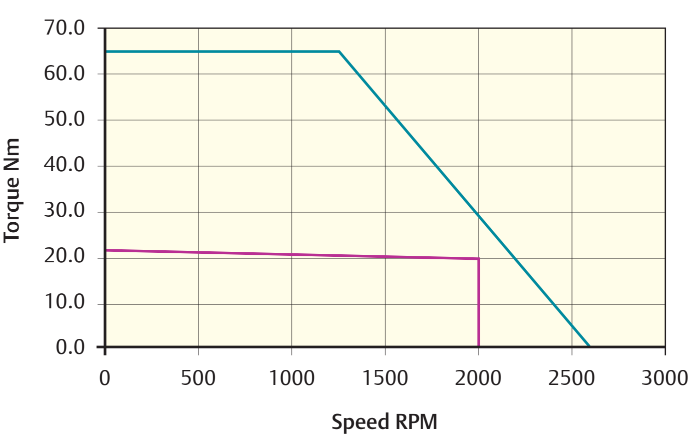
Peak torque (Nm) = **28.2** Stall torque (Nm) = **9.6** Rated torque (Nm) =9.3

190U2C2000



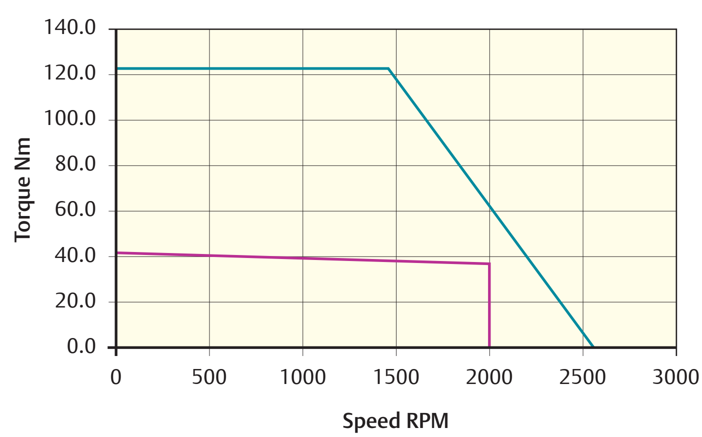
Peak torque (Nm) = **93.3** Stall torque (Nm) = **31.1** Rated torque (Nm) = **28.4**

190U2B2000



Peak torque (Nm) = **65.4** Stall torque (Nm) = **21.8** Rated torque (Nm) = **20.0**

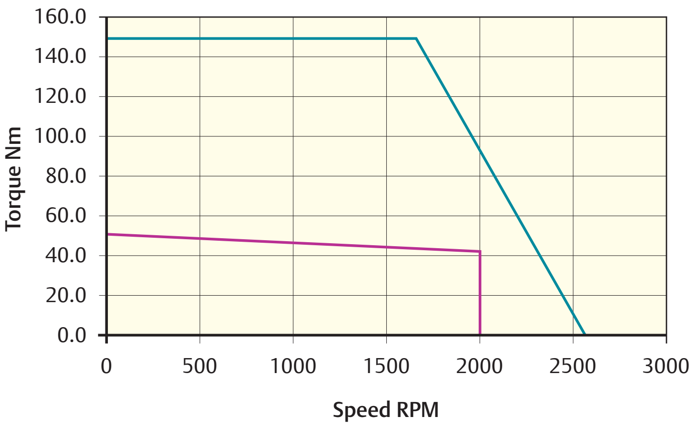
190U2D2000



Peak torque (Nm) = **123.3** Stall torque (Nm) = **41.1** Rated torque (Nm) = **36.9**

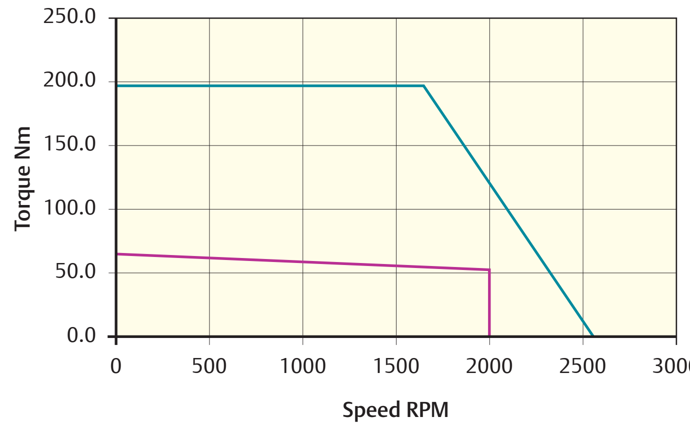
Continuous zone **Intermittent zone** *All graphs are a 40°C ambient and 400V drive supply*

190U2E2000



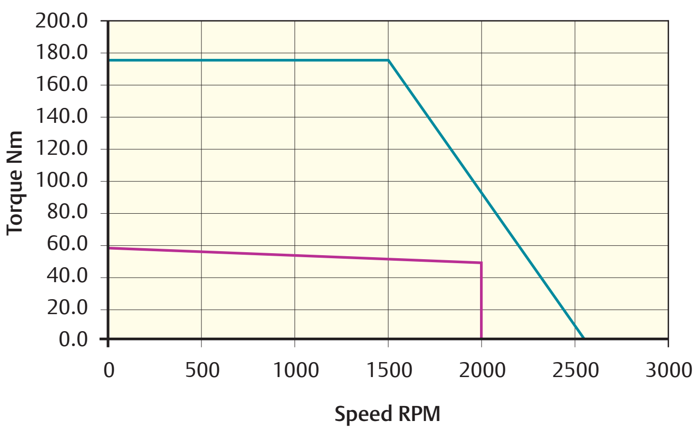
Peak torque (Nm) = **151.6** Stall torque (Nm) = **50.6** Rated torque (Nm) = **43.8**

190U2G2000



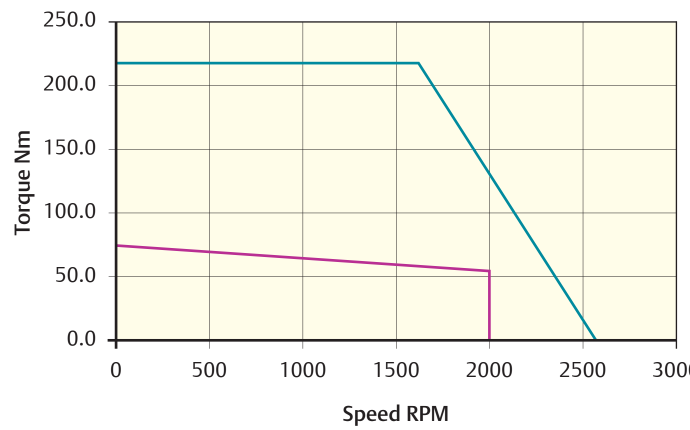
Peak torque (Nm) = **198.0** Stall torque (Nm) = **66.0** Rated torque (Nm) = **53.0**

190U2F2000



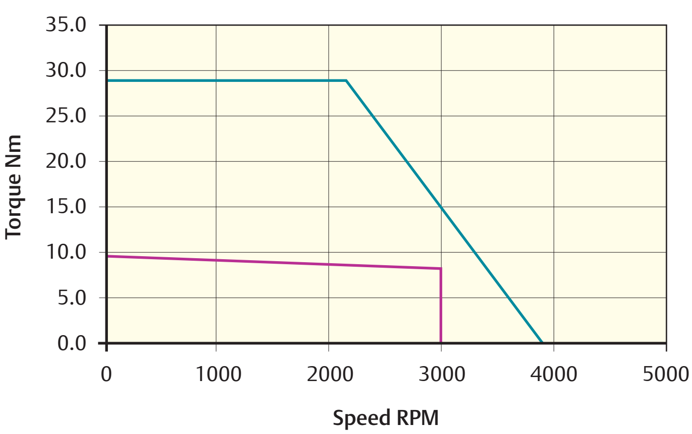
Peak torque (Nm) = **176.1** Stall torque (Nm) = **58.7** Rated torque (Nm) = **50.4**

190U2H2000



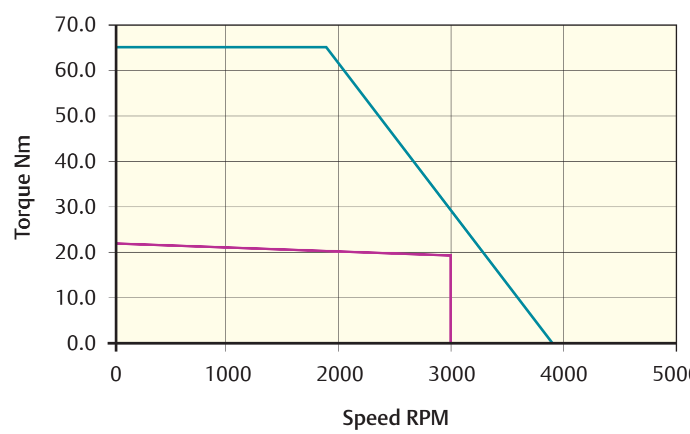
Peak torque (Nm) = **219.6** Stall torque (Nm) = **73.2** Rated torque (Nm) = **54.7**

190U2A3000



Peak torque (Nm) = **28.8** Stall torque (Nm) = **9.6** Rated torque (Nm) = **8.7**

190U2B3000



Peak torque (Nm) = **65.4** Stall torque (Nm) = **21.8** Rated torque (Nm) = **19.5**

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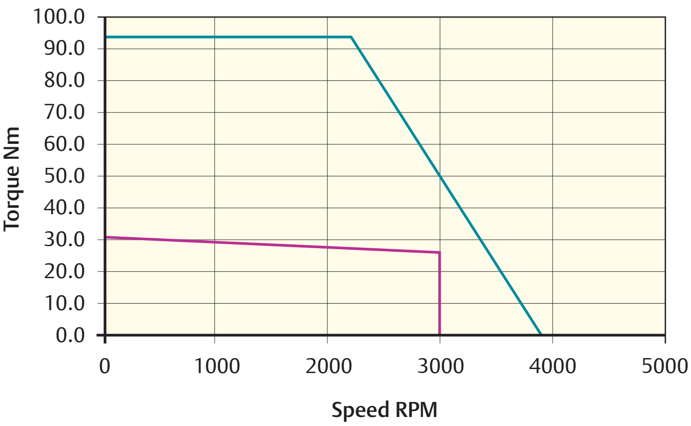
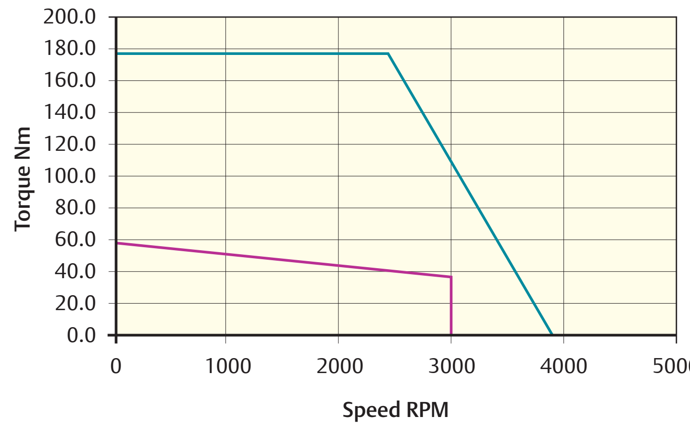
190U2C3000



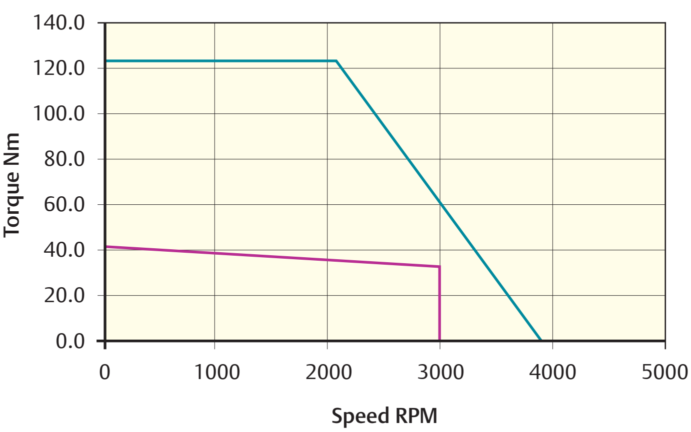
Peak torque (Nm) = **93.3** Stall torque (Nm) = **31.1** Rated torque (Nm) = **25.0**

190U2F3000



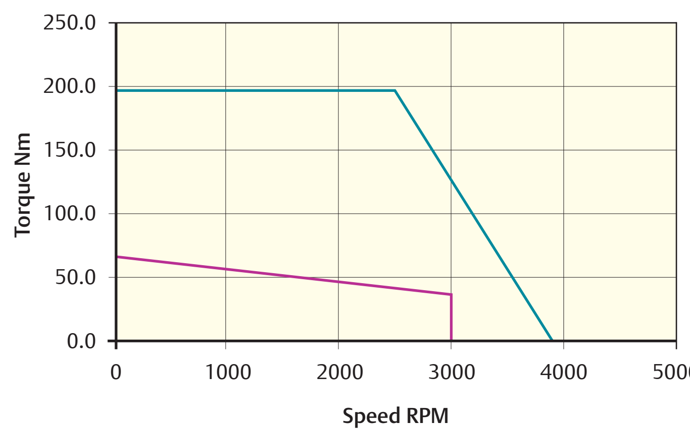
Peak torque (Nm) = **176.1** Stall torque (Nm) = **58.7** Rated torque (Nm) = **35.0**

190U2D3000



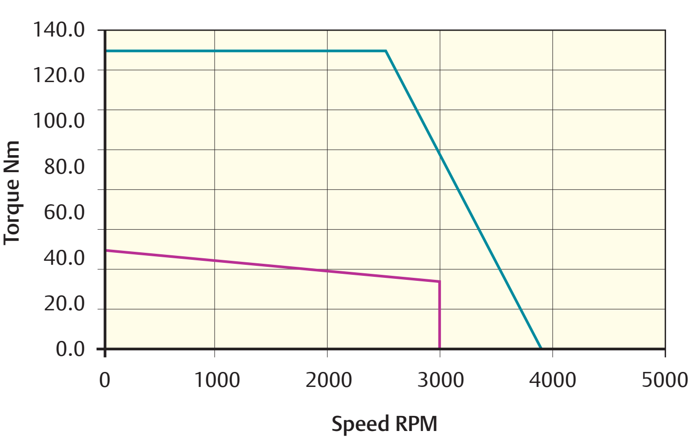
Peak torque (Nm) = **123.3** Stall torque (Nm) = **41.1** Rated torque (Nm) = **33.0**

190U2G3000



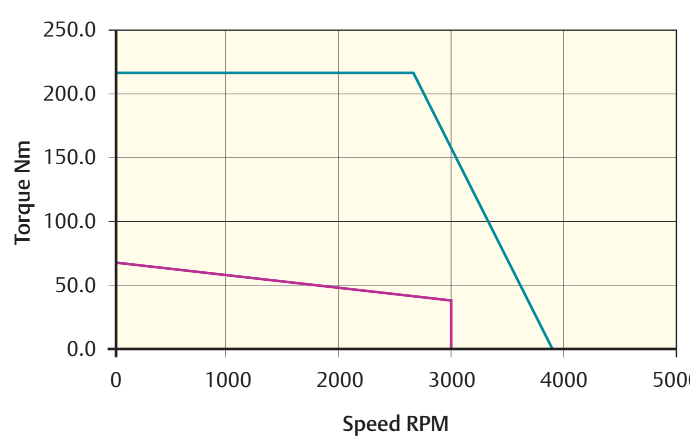
Peak torque (Nm) = **198.0** Stall torque (Nm) = **66.0** Rated torque (Nm) = **36.0**

190U2E3000



Peak torque (Nm) = **151.6** Stall torque (Nm) = **50.6** Rated torque (Nm) = **34.0**

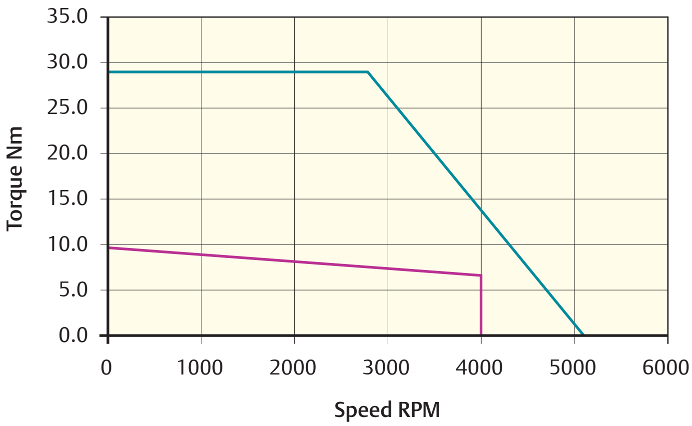
190U2H3000



Peak torque (Nm) = **219.6** Stall torque (Nm) = **73.2** Rated torque (Nm) = 36.8

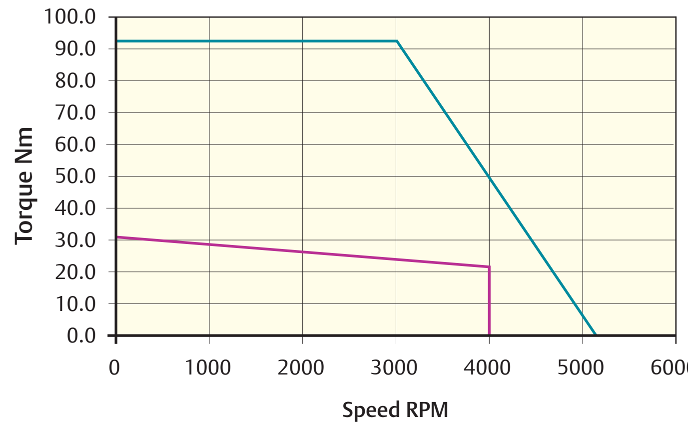
■ **Continuous zone** ■ **Intermittent zone** *All graphs are a 40°C ambient and 400V drive supply*

190U2A4000



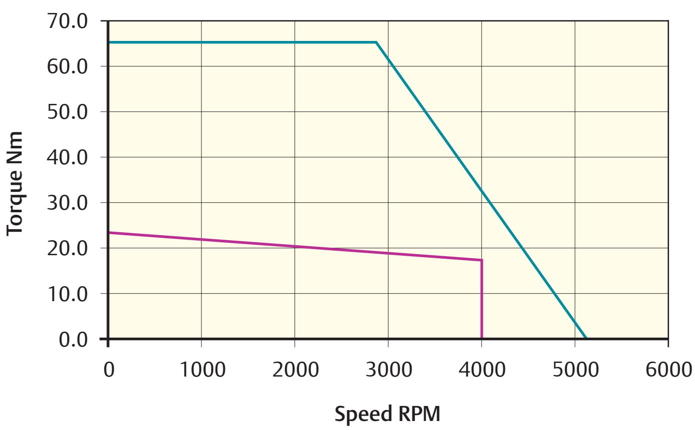
Peak torque (Nm) = **28.8** Stall torque (Nm) = **9.6** Rated torque (Nm) = **7.0**

190U2C4000



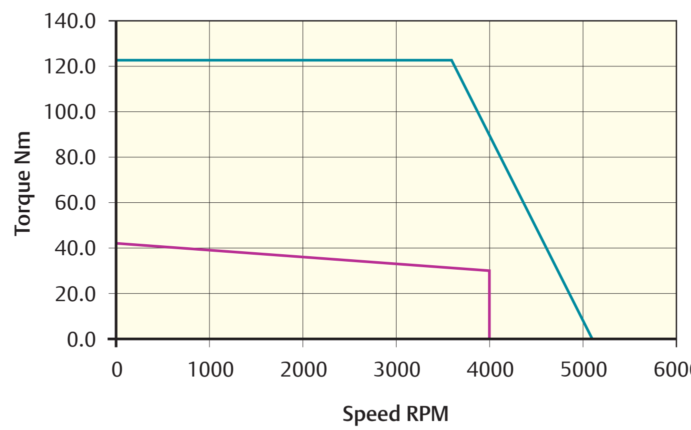
Peak torque (Nm) = **93.3** Stall torque (Nm) = **31.1** Rated torque (Nm) = **21.5**

190U2B4000



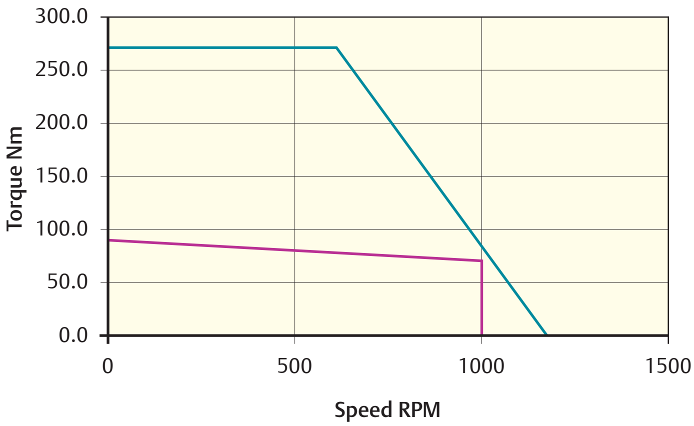
Peak torque (Nm) = **65.4** Stall torque (Nm) = **21.8** Rated torque (Nm) = **17.5**

190U2D4000



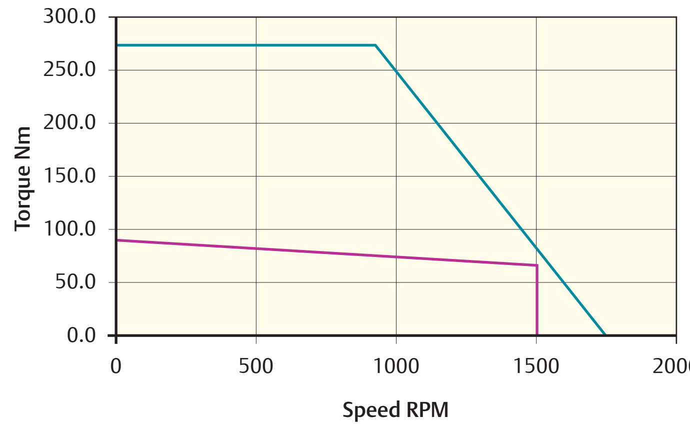
Peak torque (Nm) = **123.3** Stall torque (Nm) = **41.1** Rated torque (Nm) = **29.0**

250U2D1000



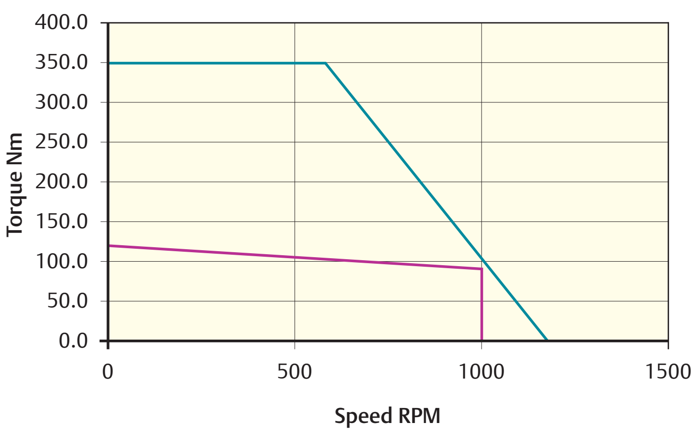
Peak torque (Nm) = **276.0** Stall torque (Nm) = **92.0** Rated torque (Nm) = **75.0**

250U2D1500



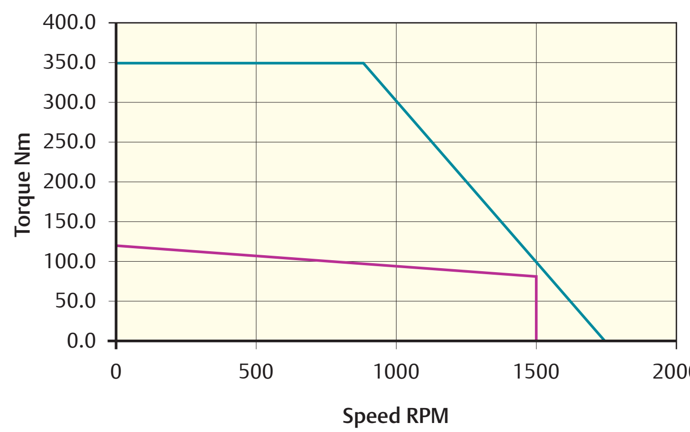
Peak torque (Nm) = **276.0** Stall torque (Nm) = **92.0** Rated torque (Nm) = **67.0**

250U2E1000



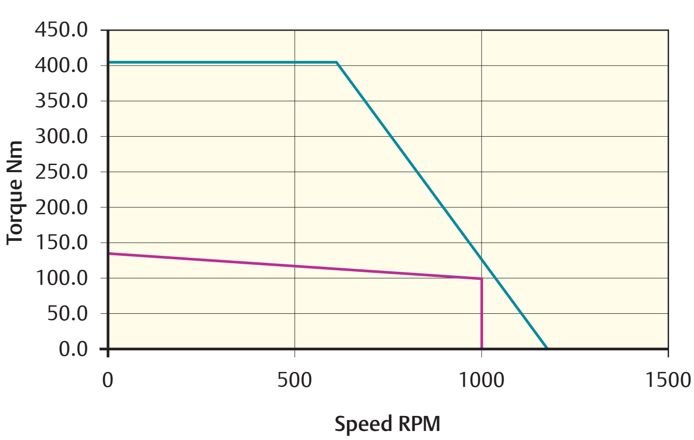
Peak torque (Nm) = **348.0** Stall torque (Nm) = **116.0** Rated torque (Nm) = **92.0**

250U2E1500



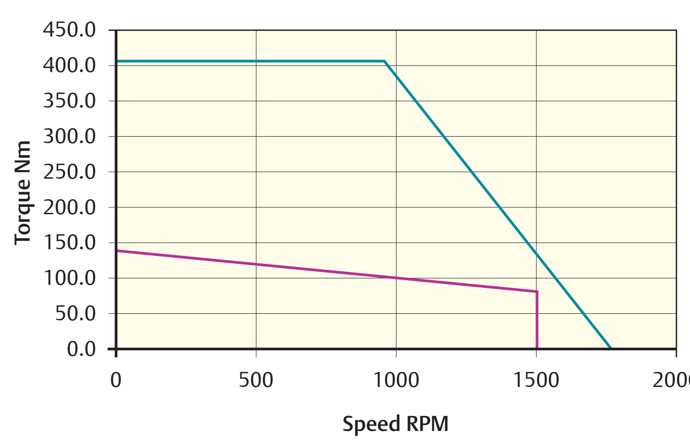
Peak torque (Nm) = **348.0** Stall torque (Nm) = **116.0** Rated torque (Nm) = **76.0**

250U2F1000



Peak torque (Nm) = **408.0** Stall torque (Nm) = **136.0** Rated torque (Nm) = **106.0**

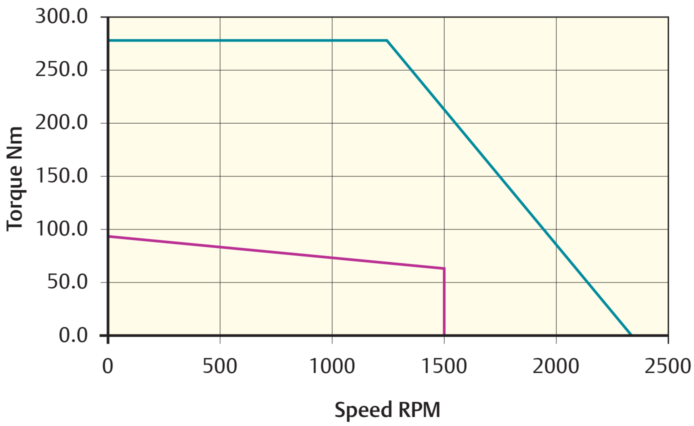
250U2F1500



Peak torque (Nm) = **408.0** Stall torque (Nm) = **136.0** Rated torque (Nm) = **84.0**

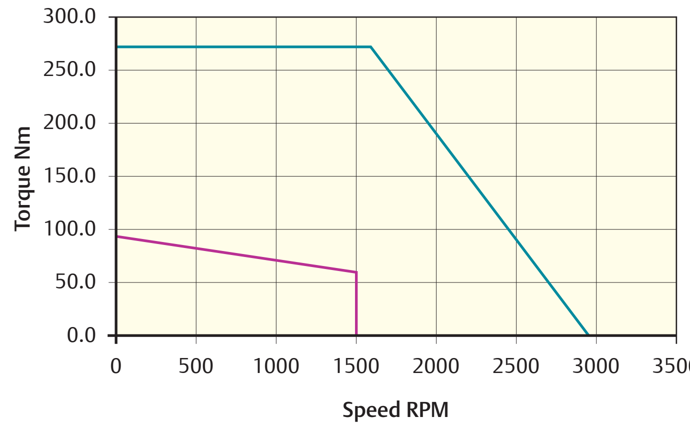
Continuous zone **Intermittent zone** *All graphs are a 40°C ambient and 400V drive supply*

250U2D2000



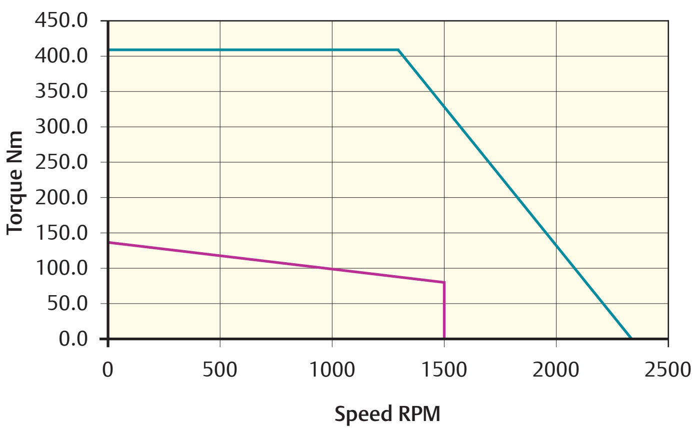
Peak torque (Nm) = **276.0** Stall torque (Nm) = **92.0** Rated torque (Nm) = **65.0**

250U2D2500



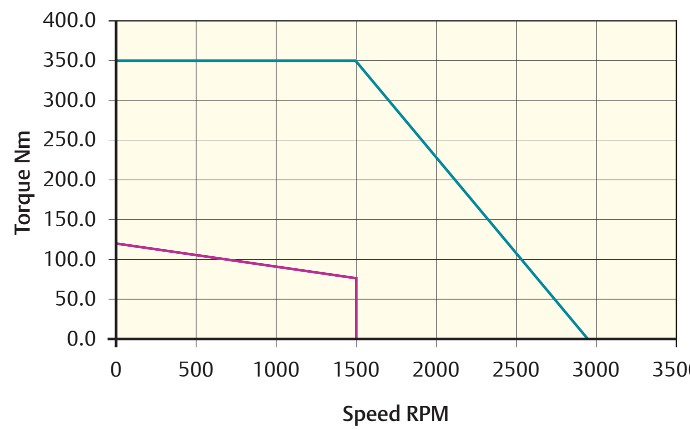
Peak torque (Nm) = **276.0** Stall torque (Nm) = **92.0** Rated torque (Nm) = **62.0**

250U2E2000



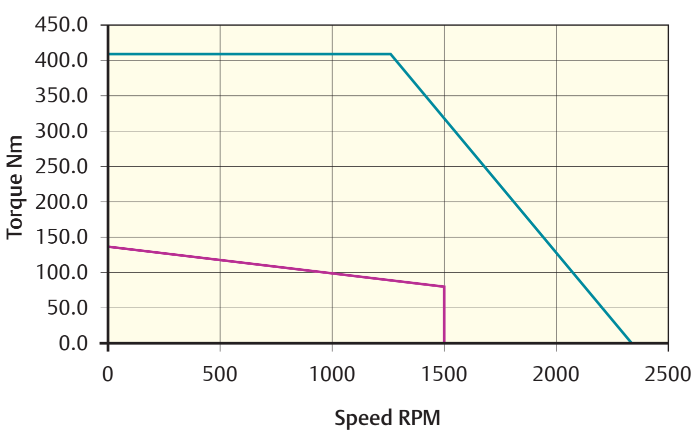
Peak torque (Nm) = **348.0** Stall torque (Nm) = **116.0** Rated torque (Nm) = **73.0**

250U2E2500



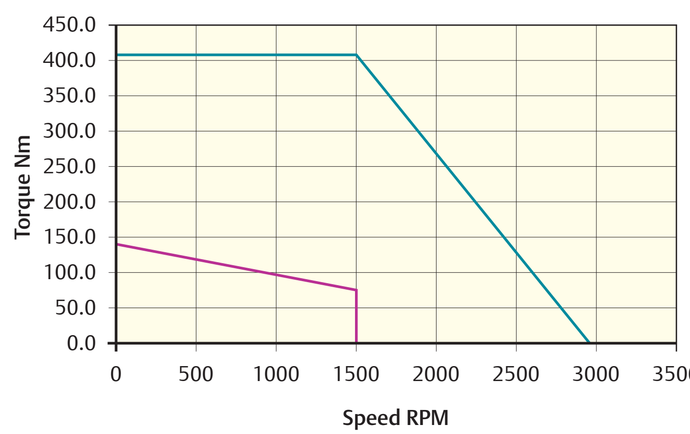
Peak torque (Nm) = **348.0** Stall torque (Nm) = **116.0** Rated torque (Nm) = **70.0**

250U2F2000



Peak torque (Nm) = **408.0** Stall torque (Nm) = **136.0** Rated torque (Nm) = **81.0**

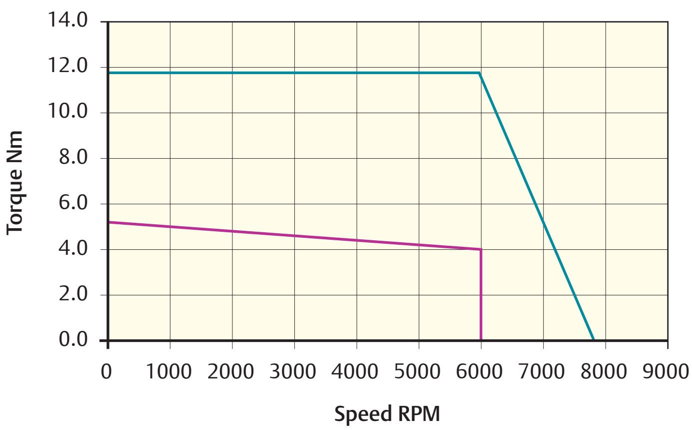
250U2F2500



Peak torque (Nm) = **408.0** Stall torque (Nm) = **136.0** Rated torque (Nm) = **77.0**

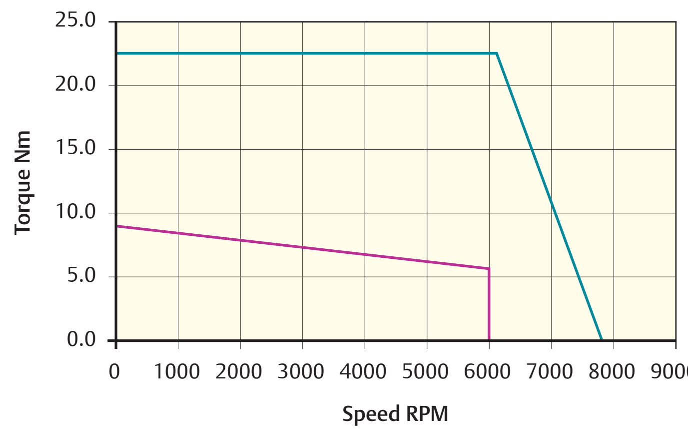
6.2 Unimotor fm fan blown

075U4D6000



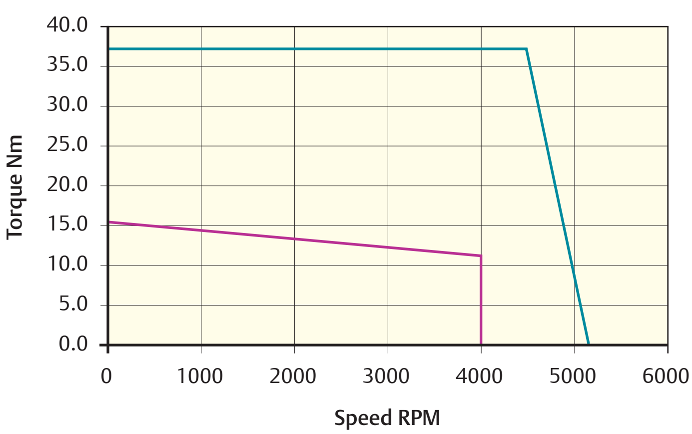
Peak torque (Nm) = **11.70** Stall torque (Nm) = **5.2** Rated torque (Nm) = **4.0**

095U4D6000



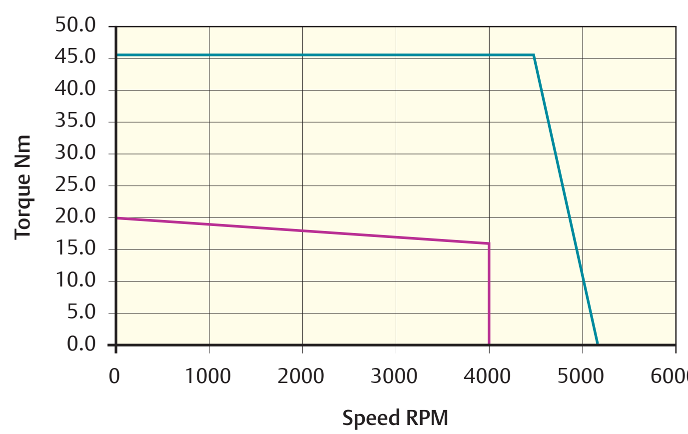
Peak torque (Nm) = **22.50** Stall torque (Nm) = **9.0** Rated torque (Nm) = **5.8**

115U4D4000

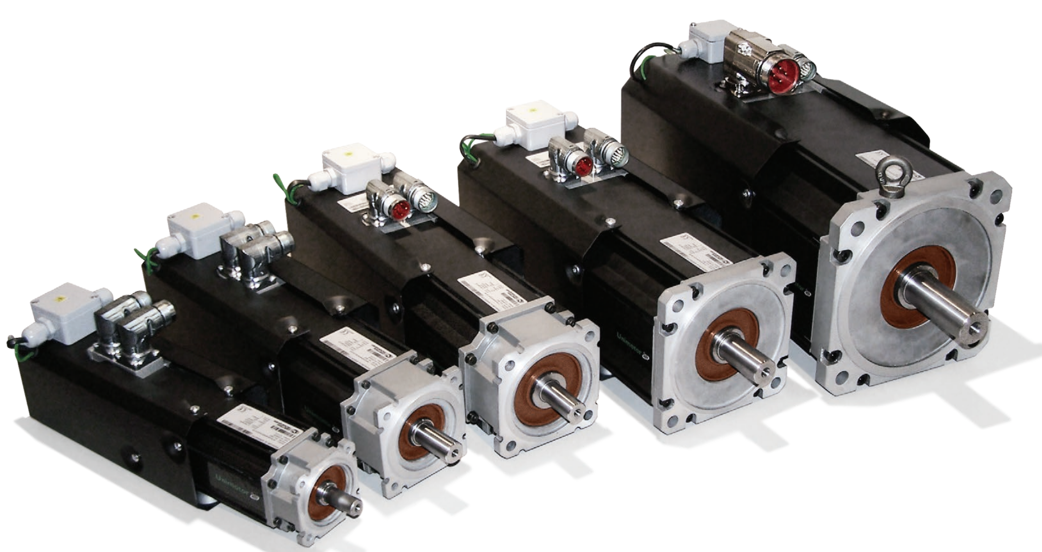


Peak torque (Nm) = **37.20** Stall torque (Nm) = **15.2** Rated torque (Nm) = **12.0**

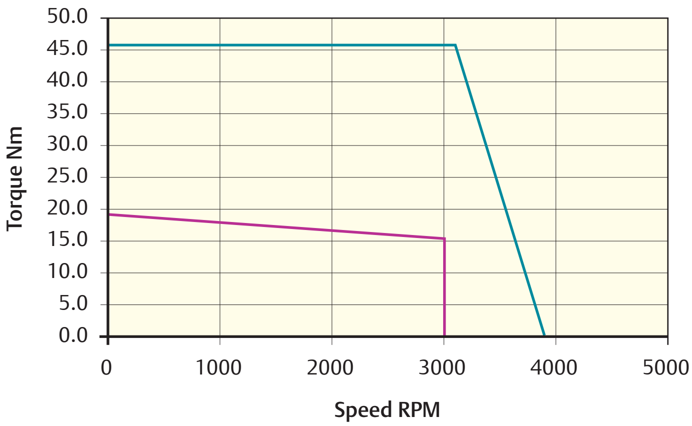
115U4E4000



Peak torque (Nm) = **45.90** Stall torque (Nm) = **20.1** Rated torque (Nm) = **16.1**

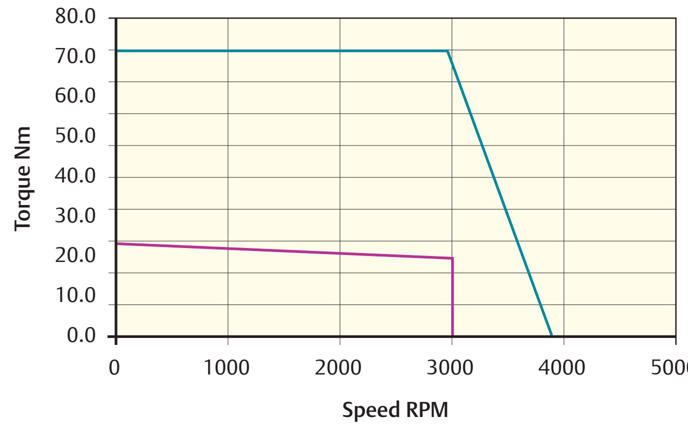


142U4C3000



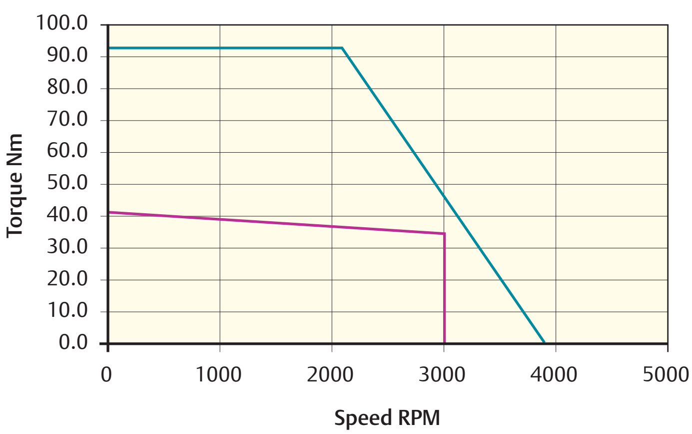
Peak torque (Nm) = **45.90** Stall torque (Nm) = **18.90** Rated torque (Nm) = **16.1**

142U4E3000



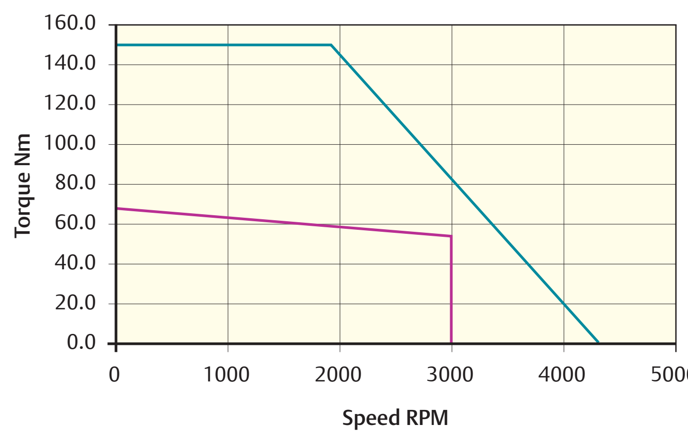
Peak torque (Nm) = **70.20** Stall torque (Nm) = **29.5** Rated torque (Nm) = **25.0**

190U4C3000



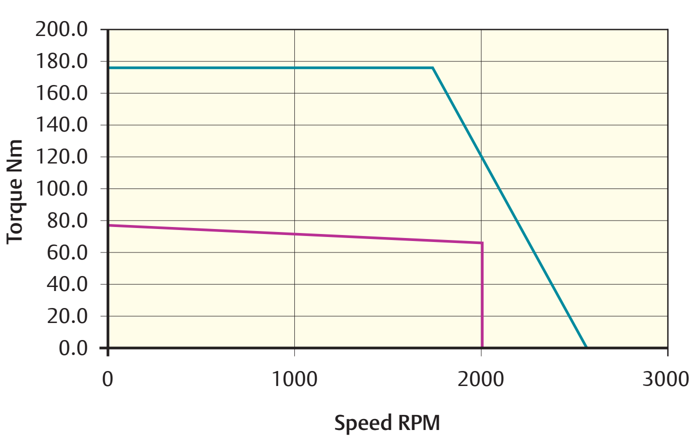
Peak torque (Nm) = **93.30** Stall torque (Nm) = **41.0** Rated torque (Nm) = **35.5**

190U4E3000



Peak torque (Nm) = **151.6** Stall torque (Nm) = **68.0** Rated torque (Nm) = **55.0**

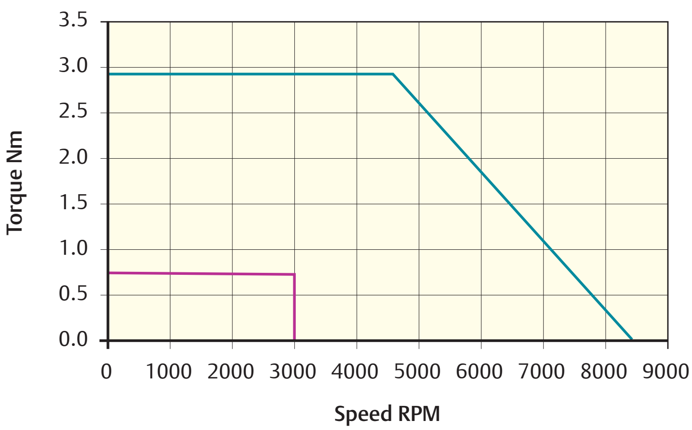
190U4F2000



Peak torque (Nm) = **176.10** Stall torque (Nm) = **79.0** Rated torque (Nm) = **66.5**

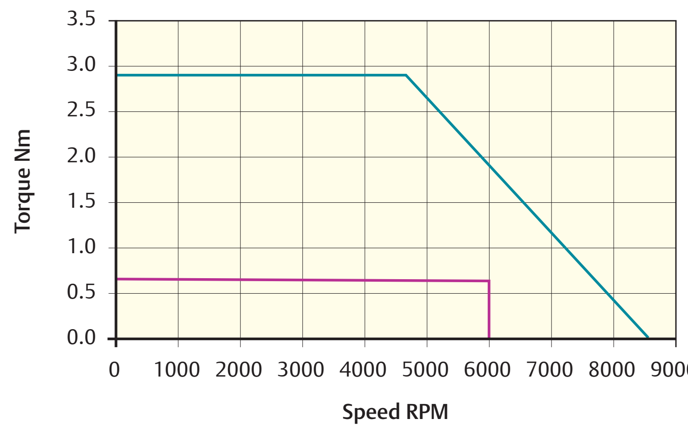
6.3 Unimotor hd

055UDA3000



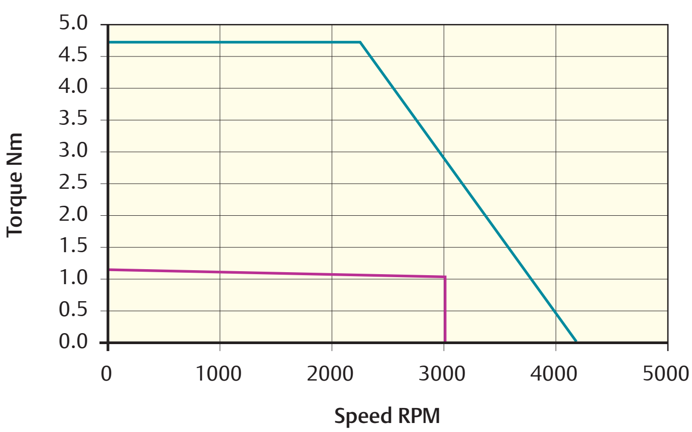
Peak torque (Nm) = **2.88** Stall torque (Nm) = **0.72** Rated torque (Nm) = **0.70**

055UDA6000



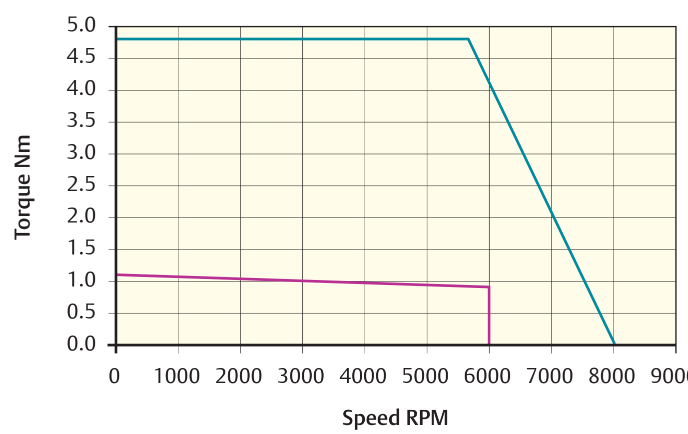
Peak torque (Nm) = **2.88** Stall torque (Nm) = **0.72** Rated torque (Nm) = **0.68**

055UDB3000



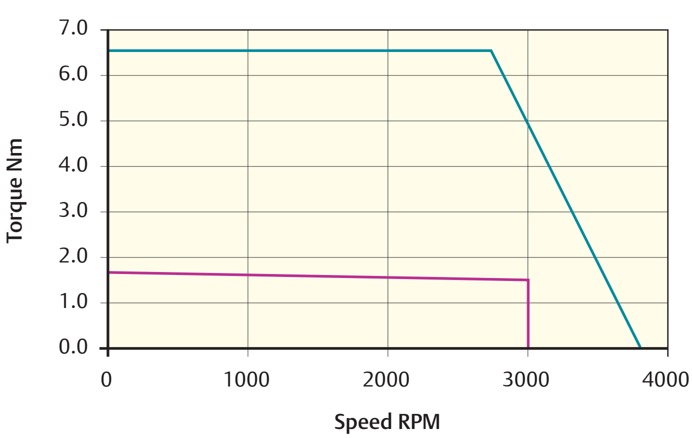
Peak torque (Nm) = **4.72** Stall torque (Nm) = **1.18** Rated torque (Nm) = **1.05**

055UDB6000



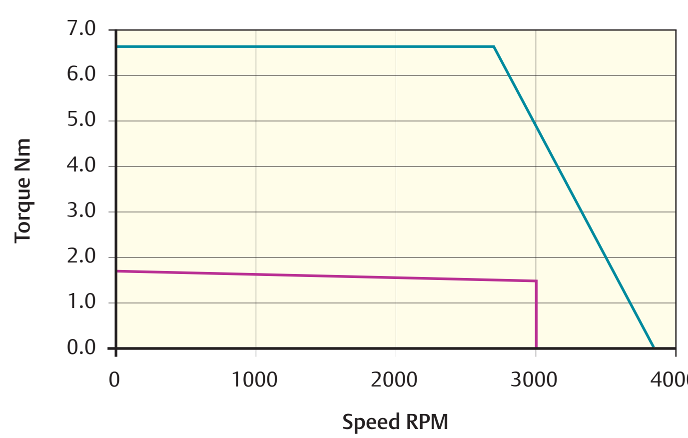
Peak torque (Nm) = **4.72** Stall torque (Nm) = **1.18** Rated torque (Nm) = **0.90**

055UDC3000



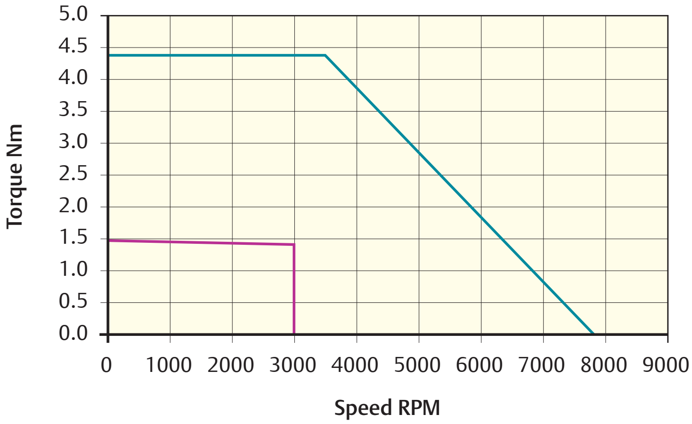
Peak torque (Nm) = **6.60** Stall torque (Nm) = **1.65** Rated torque (Nm) = **1.48**

055UDC3000



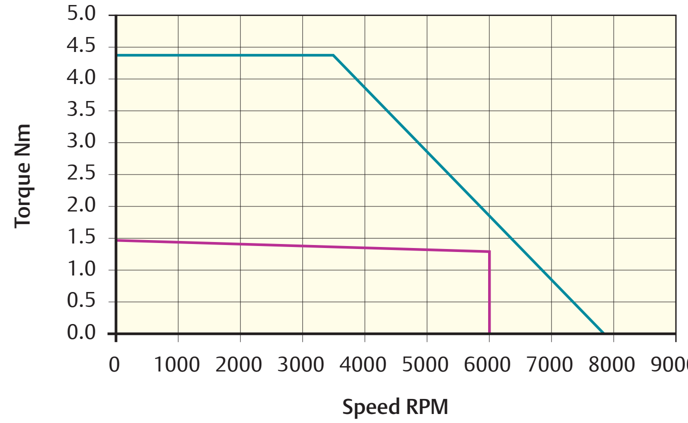
Peak torque (Nm) = **6.60** Stall torque (Nm) = **1.65** Rated torque (Nm) = **1.48**

067UDA3000



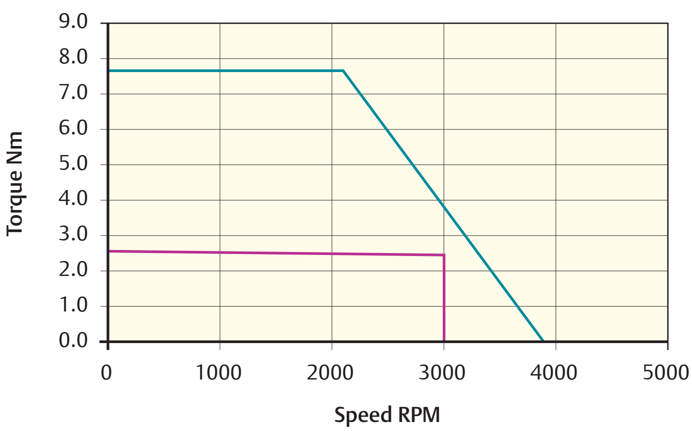
Peak torque (Nm) = **4.35** Stall torque (Nm) = **1.45** Rated torque (Nm) = **1.40**

067UDA6000



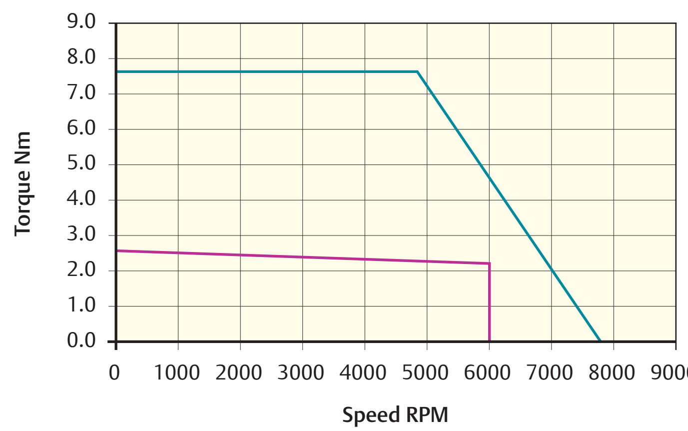
Peak torque (Nm) = **4.35** Stall torque (Nm) = **1.45** Rated torque (Nm) = **1.30**

067UDB3000



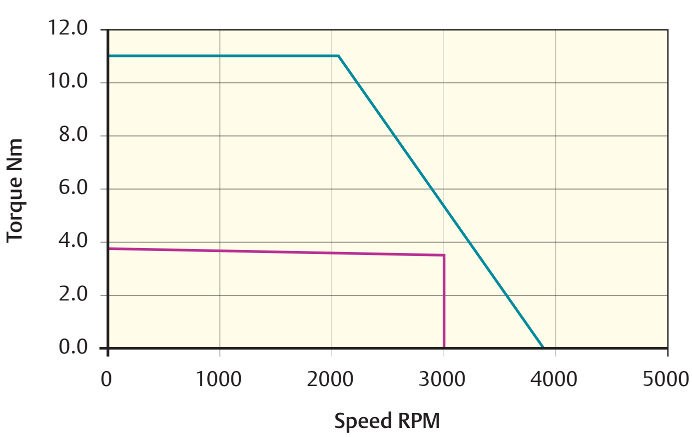
Peak torque (Nm) = **7.65** Stall torque (Nm) = **2.55** Rated torque (Nm) = **2.45**

067UDB6000



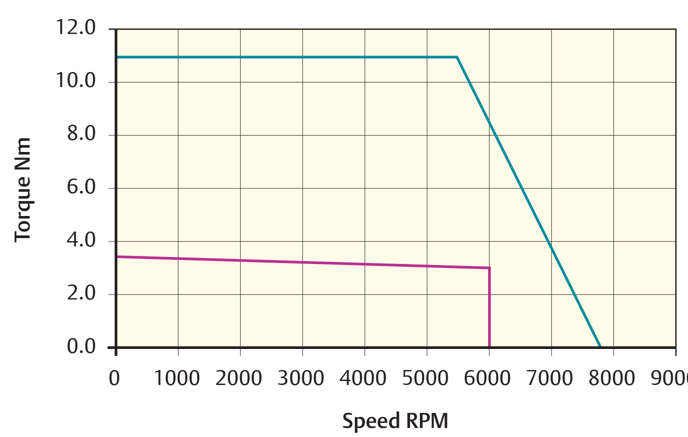
Peak torque (Nm) = **7.65** Stall torque (Nm) = **2.55** Rated torque (Nm) = **2.20**

067UDC3000



Peak torque (Nm) = **11.10** Stall torque (Nm) = **3.70** Rated torque (Nm) = **3.50**

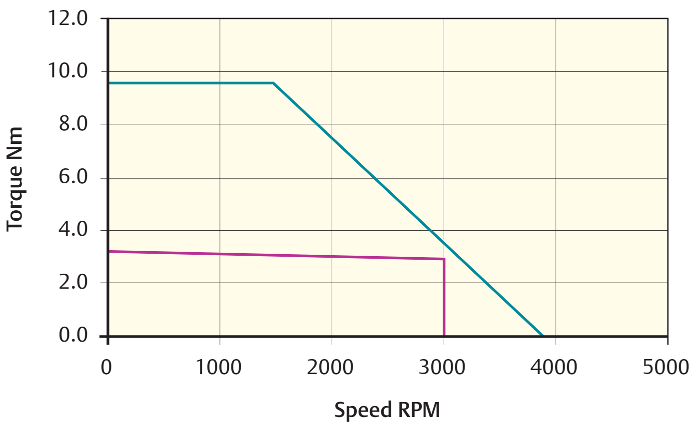
067UDC6000



Peak torque (Nm) = **11.10** Stall torque (Nm) = **3.70** Rated torque (Nm) = **3.10**

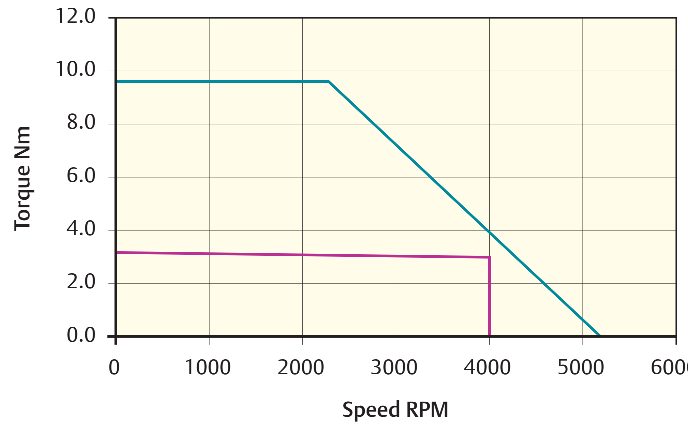
EMERSON
Industrial Automation

089UDA3000



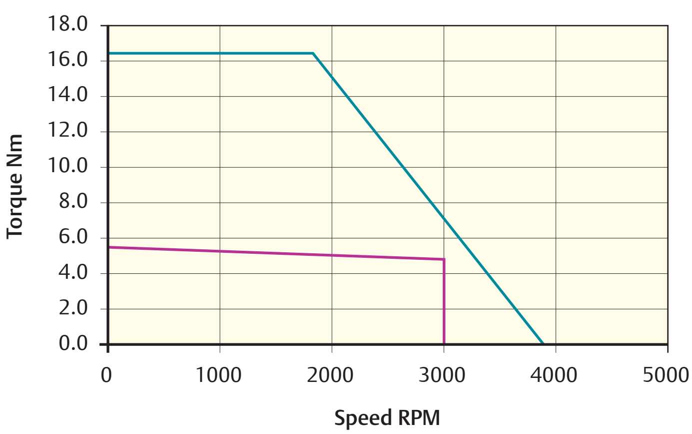
Peak torque (Nm) = **9.60** Stall torque (Nm) = **3.20** Rated torque (Nm) = **3.00**

089UDA4000



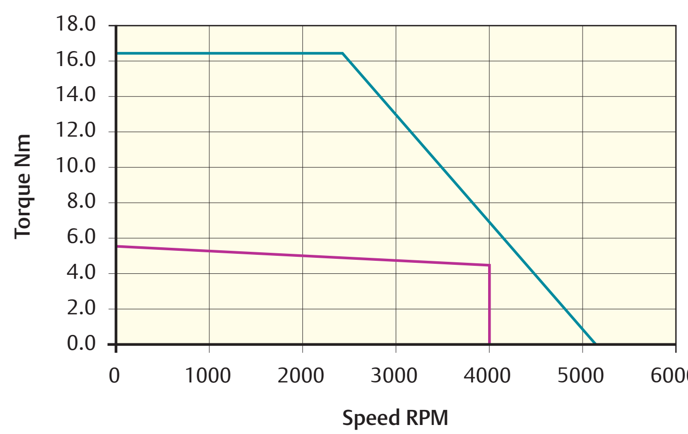
Peak torque (Nm) = **9.60** Stall torque (Nm) = **3.20** Rated torque (Nm) = **2.90**

089UDB3000



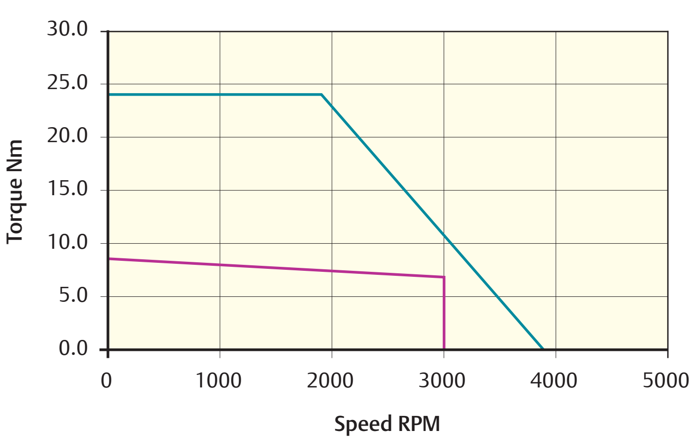
Peak torque (Nm) = **16.50** Stall torque (Nm) = **5.50** Rated torque (Nm) = **4.85**

089UDB4000



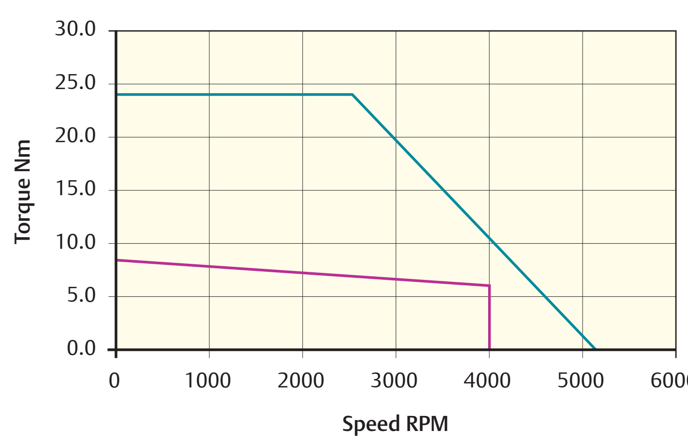
Peak torque (Nm) = **16.50** Stall torque (Nm) = **5.50** Rated torque (Nm) = **4.55**

089UDC3000



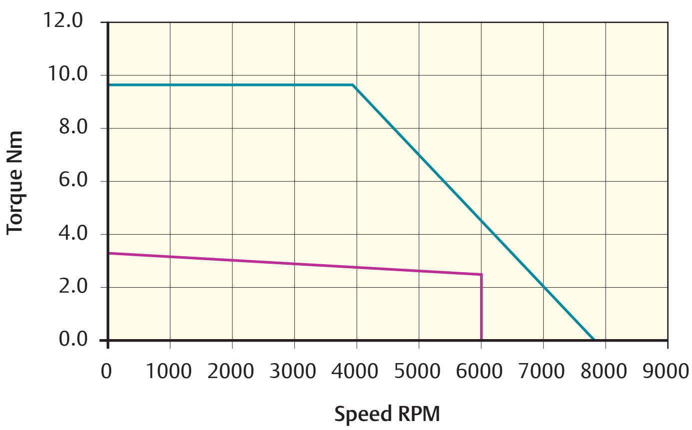
Peak torque (Nm) = **24.00** Stall torque (Nm) = **8.00** Rated torque (Nm) = **6.90**

089UDC4000



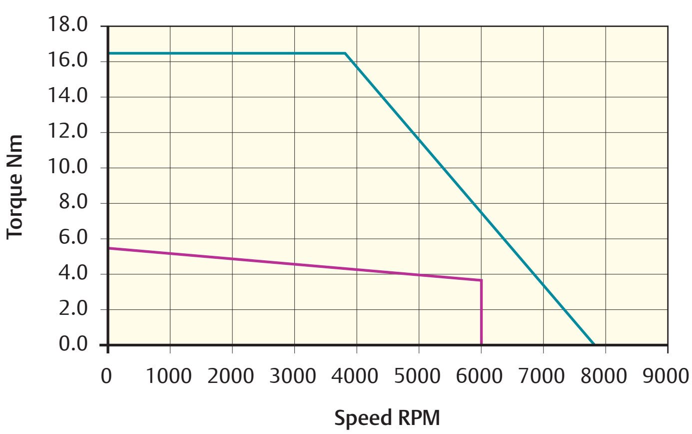
Peak torque (Nm) = **24.00** Stall torque (Nm) = **8.00** Rated torque (Nm) = **6.35**

089UDA6000



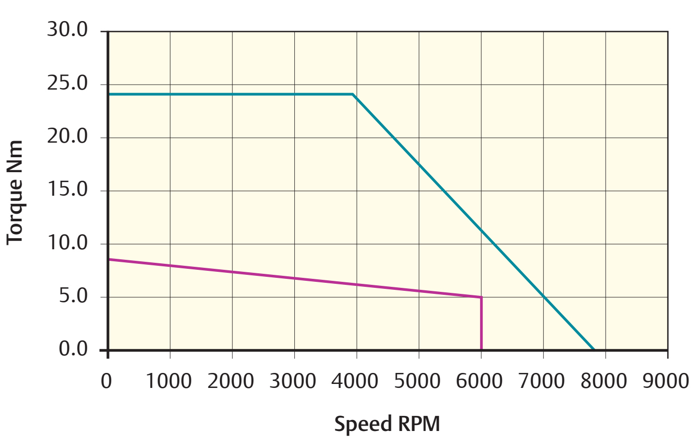
Peak torque (Nm) = **9.60** Stall torque (Nm) = **3.20** Rated torque (Nm) = **2.65**

089UDB6000



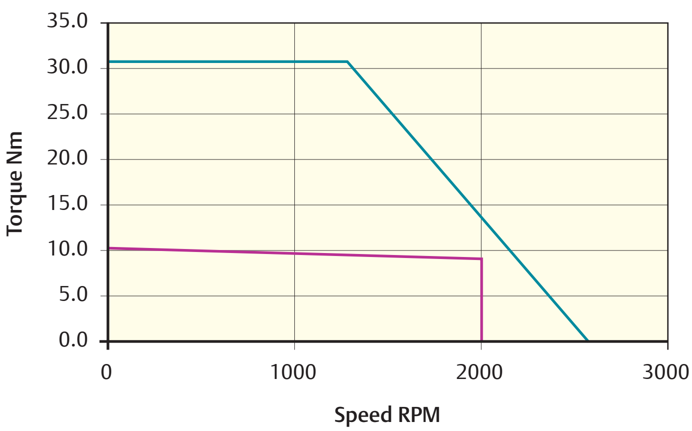
Peak torque (Nm) = **16.50** Stall torque (Nm) = **5.50** Rated torque (Nm) = **3.80**

089UDC6000



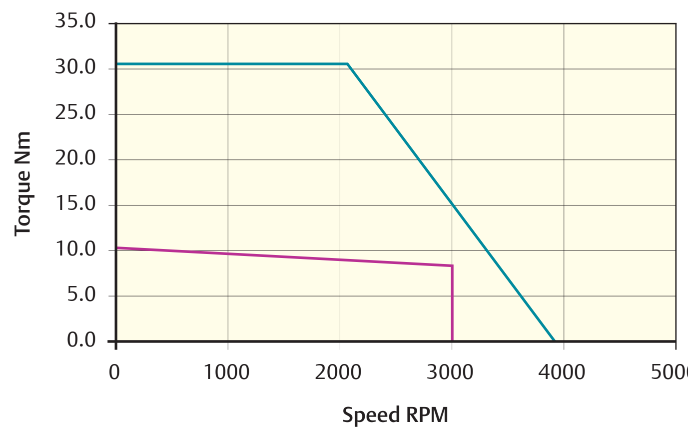
Peak torque (Nm) = **24.00** Stall torque (Nm) = **8.00** Rated torque (Nm) = **5.00**

115UDB2000



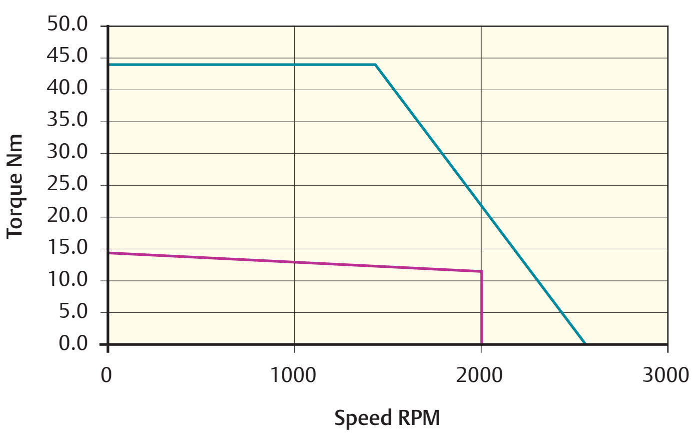
Peak torque (Nm) = **30.60** Stall torque (Nm) = **10.20** Rated torque (Nm) = **8.60**

115UDB3000



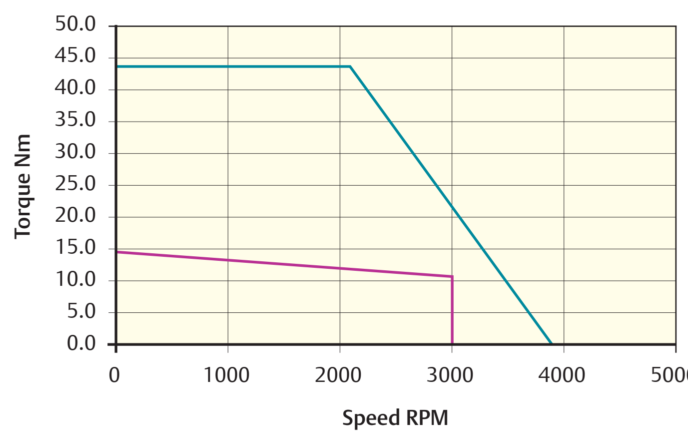
Peak torque (Nm) = **30.60** Stall torque (Nm) = **10.20** Rated torque (Nm) = **7.70**

115UDC2000



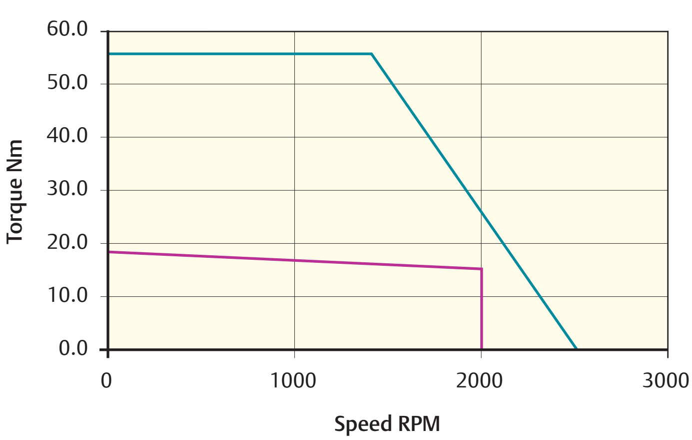
Peak torque (Nm) = **43.80** Stall torque (Nm) = **14.60** Rated torque (Nm) = **11.90**

115UDC3000



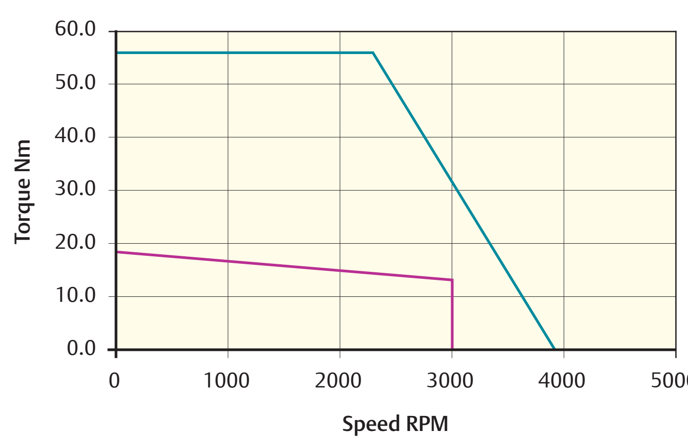
Peak torque (Nm) = **43.80** Stall torque (Nm) = **14.60** Rated torque (Nm) = **10.50**

115UDD2000



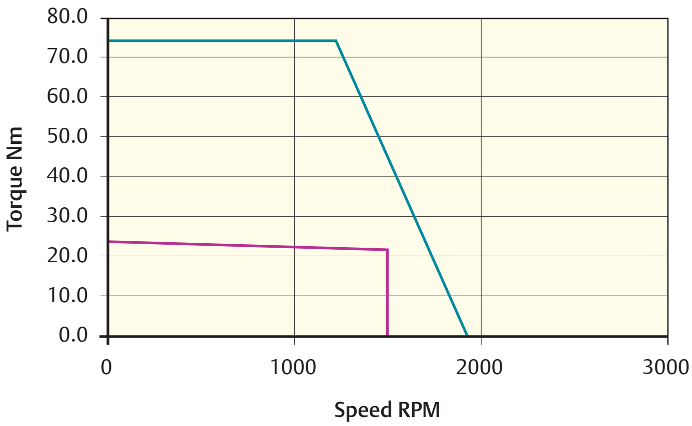
Peak torque (Nm) = **56.40** Stall torque (Nm) = **18.80** Rated torque (Nm) = **15.60**

115UDD3000



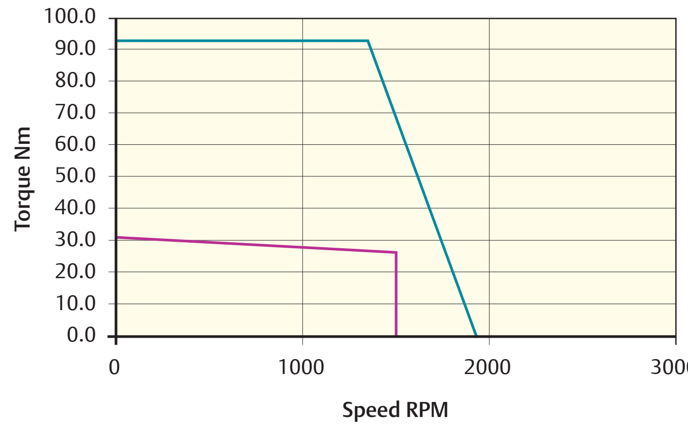
Peak torque (Nm) = **56.40** Stall torque (Nm) = **18.80** Rated torque (Nm) = **13.60**

142UDC1500



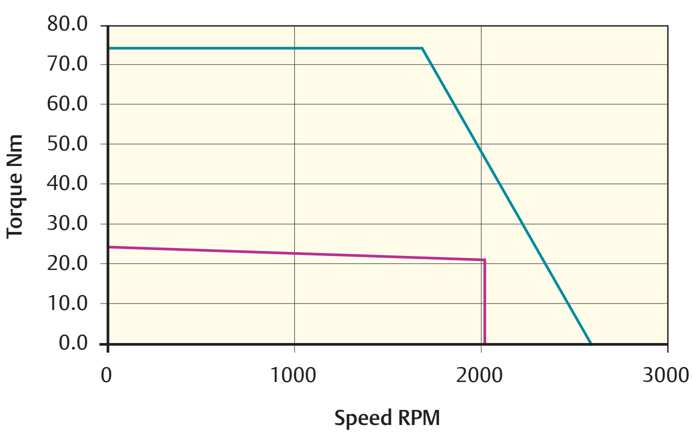
Peak torque (Nm) = **74.90** Stall torque (Nm) = **25.00** Rated torque (Nm) = **22.30**

142UDD1500



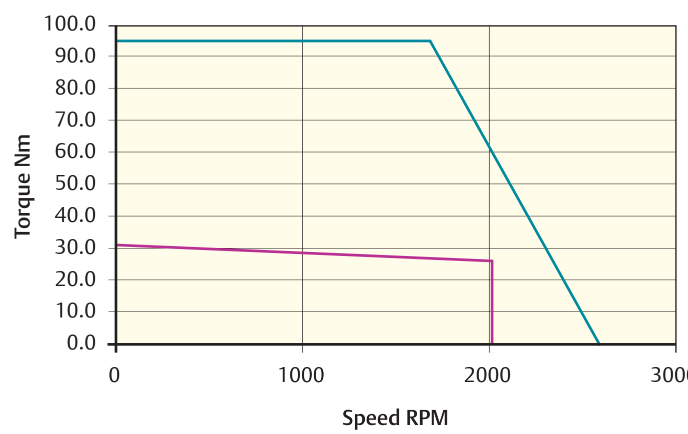
Peak torque (Nm) = **94.50** Stall torque (Nm) = **31.50** Rated torque (Nm) = **27.00**

142UDC2000



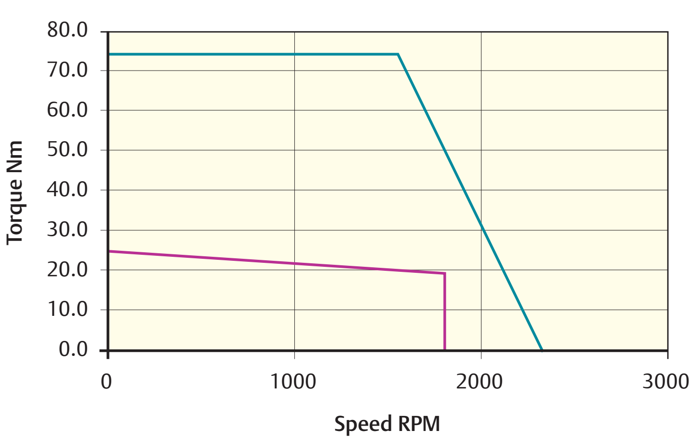
Peak torque (Nm) = **74.90** Stall torque (Nm) = **25.00** Rated torque (Nm) = **21.40**

142UDD2000



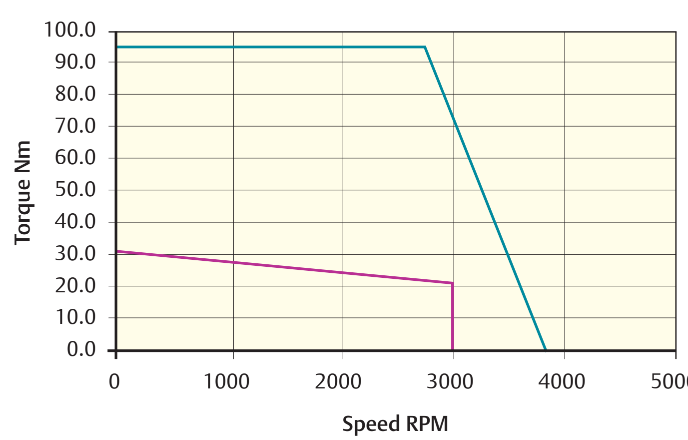
Peak torque (Nm) = **94.50** Stall torque (Nm) = **31.50** Rated torque (Nm) = **25.70**

142UDC3000



Peak torque (Nm) = **74.90** Stall torque (Nm) = **25.00** Rated torque (Nm) = **18.40**

142UDD3000



Peak torque (Nm) = **94.50** Stall torque (Nm) = **31.50** Rated torque (Nm) = **20.90**

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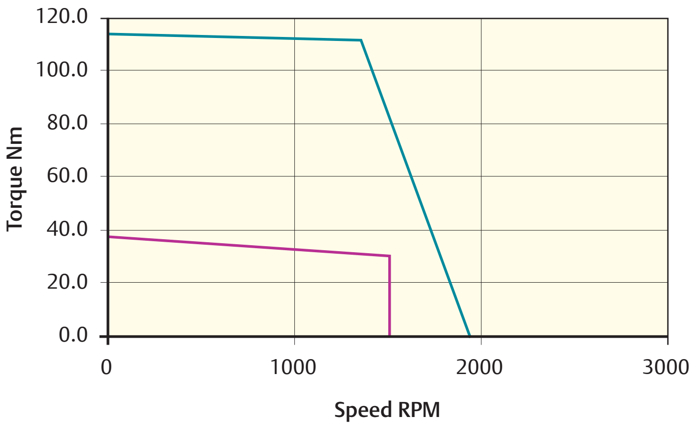
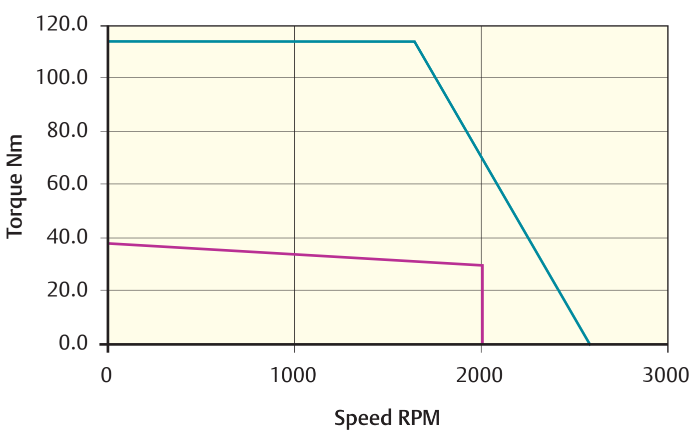
142UDE1500



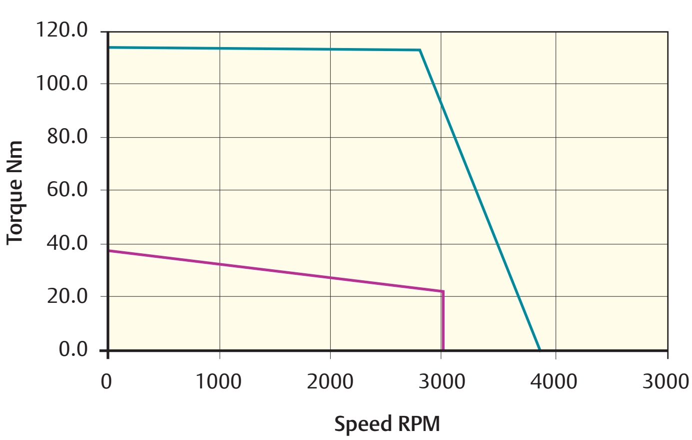
Peak torque (Nm) = **114.00** Stall torque (Nm) = **38.00** Rated torque (Nm) = **31.70**

142UDE2000



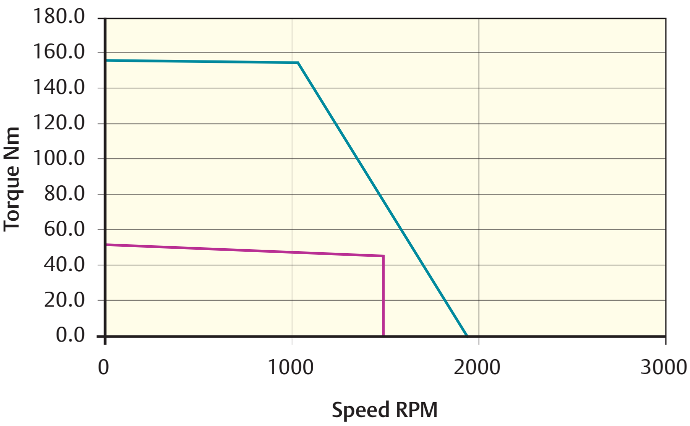
Peak torque (Nm) = **114.00** Stall torque (Nm) = **38.00** Rated torque (Nm) = **29.60**

142UDE3000



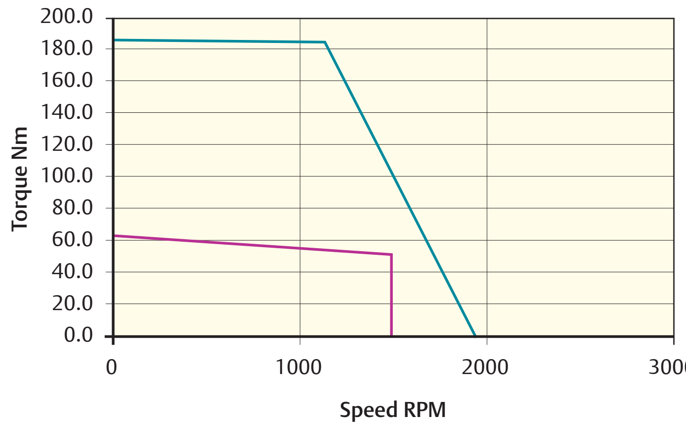
Peak torque (Nm) = **114.00** Stall torque (Nm) = **38.00** Rated torque (Nm) = **23.00**

190UDC1500



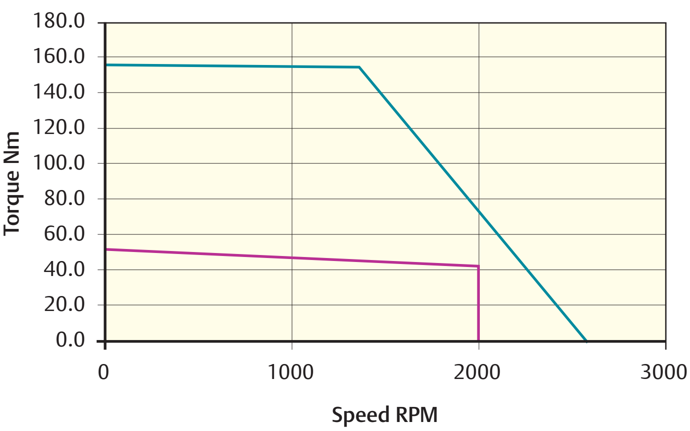
Peak torque (Nm) = **156.00** Stall torque (Nm) = **52.00** Rated torque (Nm) = **46.20**

190UDD1500



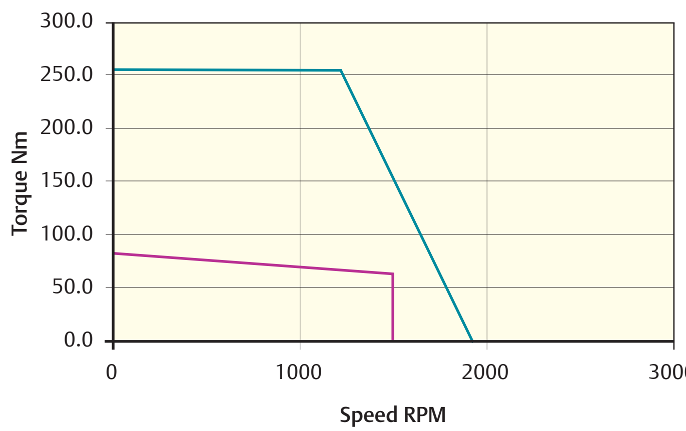
Peak torque (Nm) = **186.00** Stall torque (Nm) = **62.00** Rated torque (Nm) = **52.20**

190UDC2000



Peak torque (Nm) = **156.00** Stall torque (Nm) = **52.00** Rated torque (Nm) = **42.50**

190UDF1500



Peak torque (Nm) = **255.00** Stall torque (Nm) = **85.00** Rated torque (Nm) = **68.50**

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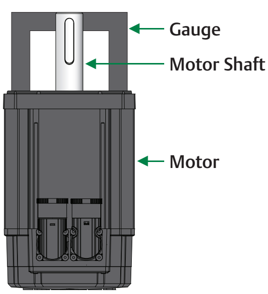
7 Pulley installation

Large numbers of motors returned for repair have the shafts "knocked back" into the motor. This can be caused by the incorrect fitting of pulleys and coupling etc. to the motor shaft.

This incorrect fitting of pulleys and gears will at least cause damage to the front bearing, reducing the motors working life. In the worst case damage to the encoder (broken disc), or misalignment the resolver rotor will cause the motor to fail immediately.

This section is intended to explain the correct way of fitting parts to the shaft without causing damage. These instructions should be followed in all cases.

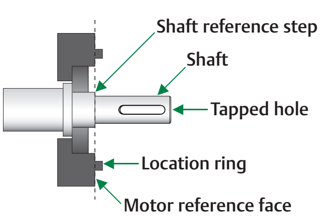
When the motor is built in production a go/no-go gauge, which is made to the minimum shaft extension dimension, is used to check that the shaft is correctly placed within the motor housing. This gauge is placed over the shaft and a check is made to ensure that the shaft is fitted correctly.



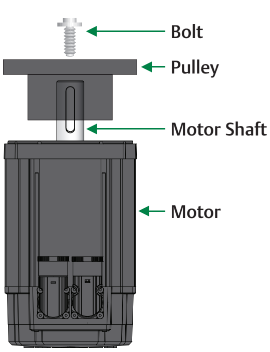
When a motor is returned from the field this gauge is used once more.

If the shaft has been "knocked back" then it is very quickly noticeable using this check.

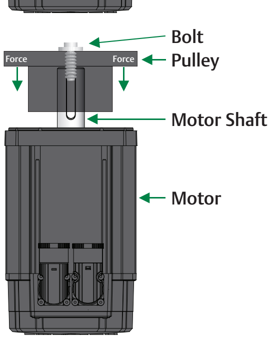
For a pulley or gear to be fitted correctly the following procedure must be followed:



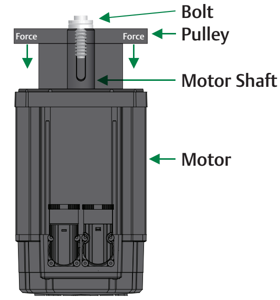
The diagram left shows the front face of the Unimotor, when using the following instructions the component hub should be drawn against the shaft reference step, which is in line with the motor reference face.



When fitting a pulley, a system that pushes the pulley down the shaft while pulling the shaft up through the pulley should be applied. A simple technique is to use a bolt with a washer.



Screw the bolt into the tapped hole of the shaft and, while holding the pulley, use it to push the pulley down and pull the shaft through at the same time.



Once the bolt has bottomed out unscrew it and place another washer underneath. Continue this process until the pulley is squeezed home.

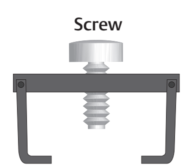
Never hammer or force the pulley onto the shaft as this will result in damage to the bearing and or the encoder therefore reducing the life of the motor.

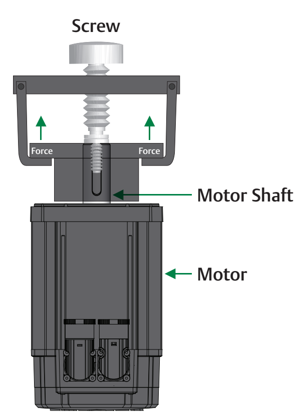
Note.

Circlips were removed from our rotors after an investigation into shafts snapping proved that the groves needed to fit the Circlips weakened the shaft.

Below is a table detailing the tapped hole sizes.

Frame Size	Tapped hole (mm)
55A-C	M4 x 10.0
75A	M4 x 10.0/12.0
74B-95A	M5 x 12.5/14.5
95B115C	M6 x 16.0/18.0
115D-142E	M8 x 19.0/21.0
190A-D	M12 x 28.8





To remove pulleys a two or three legged gear puller must be used.

This tool grips the outer trim of the pulley and, then using the threaded screw of the gear puller against the shaft, the pulley can be raised off the shaft without any force being applied to the motor.

A socket head screw should be screwed into the end of the shaft to protect the thread from damage.

Failure to apply these simple methods may render the motor useless or in need of repair.

EMERSON
Industrial Automation

8 Declarations

EC DECLARATION OF CONFORMITY

We, the manufacturer:

Control Techniques Dynamics Ltd. (part of Emerson Industrial Automation)
South Way, Walworth Industrial Estate, Andover, Hampshire SP10 5AB, United Kingdom

Tel: +44 (0) 1264 387 600 Fax: +44 (0) 1264 356 561

Certify and declare under our sole responsibility that the following products:

Name	**Unimotor hd**
Description	AC Brushless Permanent Magnet Electric Servo Motors
Catalogue numbers	067UD*********, 070UD*********, 089UD*********, 115UD*********, 067ED********, 070ED********, 089ED*********, 115ED*********, 067XD********, 142UD*********, 142ED*********, 142UG*********, 158UG**********, 190UD*********, 190ED********, 190UF*********, 190EF*********, 190UH*********, 190EH*********

* maybe any number or letter indicating motor options which do not affect this DoC.

+ Added to the right hand side of these part numbers there maybe an additional 6 digits indicating PCD of the mounting register and the shaft diameter. In addition to this there may also be a '-' followed by 4 letters indicating that the motor is a 'special' or a gearbox is fitted.

Comply with the essential requirements and provisions of the Low Voltage Directive 2006/95/EC and of the EMC Directive 2004/108/EC based on the following specifications applied:

EU Harmonised Standards under directive 2006/95/EC: EN 60034-1:2004 , EN 60034-5:2001, EN 60034-6:1993, EN 60034-7:1993, EN 60034-8:2007, EN 60034-14:2004, EN 60204-1:2006

EU Harmonised Standards under directive 2004/108/EC: EN 61000-6-2:2005, EN 61000 -6-4:2007

Year of CE Marking: 2010

Signed

Keith Hedges
Managing Director

5th July 2012

Control Techniques Dynamics Ltd.
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United Kingdom

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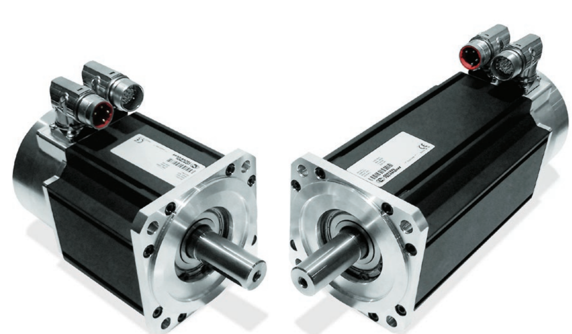

EC DECLARATION OF CONFORMITY

Manufacturers Name: Control Techniques Dynamics Limited

Manufacturers' Address: South Way, Walworth Industrial Estate, Andover, Hampshire, SP105AB

Declare under our sole responsibility that the Brushless Permanent Magnet Servo Motors described below comply with applicable Health and Safety Requirements of Annex I of the Low Voltage Directive 2006/95/EC and Annex II of the ATEX Directive 94/9/EC and the EMC Directive 2004/108/EC. Confidential technical documentation has been compiled according to the specific requirements of each directive:

Description of product: Brushless Permanent Magnet Servo Motors Types 480V U2, UM/SL, UD 220V E2, EZ, ED.

Standard rating: Frame Size 067 to 250, 480V AC, 11.6 kW maximum, Speed 0-6000 RPM, Thermal Classification: Delta 100°C.

ATEX rating: Unimotor UM and fm frame size 075 to 190, 480V AC, 11.6 kW maximum, Speed 0-3000 RPM, Thermal Classification: Delta 100°C.

Atex Gas

Ex II 3 G Ex pz T3 (0<Ta<40°C) BSI 09 ATEX 546579X

Atex Dust

Ex II 3 D Ex tD A22 IP65 T 200°C BSI 09 ATEX 546579X

The following standards have either been referred to or have been complied with in part or in full:

Reference	Title
EN 60034-1:2004	Rotating electrical machines – Part 1: Rating and performance
EN 60034-5:2001	Rotating electrical machines – Part 5: IP Code
EN 60034-6:1993	Rotating electrical machines – Part 6: IC Rating
EN 60034-7:1993	Rotating electrical machines – Part 7: IM Rating
EN 60034-8:2007	Rotating electrical machines – Part 8: Terminal markings and direction of rotation
EN 60034-14:2004	Rotating electrical machines – Part 14: Mechanical vibration
EN 60204-1:2006	Safety of machinery – Electrical equipment of machines Part1: General requirements
EN 60079-0:2006	Electrical apparatus for explosive gas atmospheres – general requirements
EN 60079-2:2007	Electrical apparatus for explosive gas atmospheres – pressurised enclosures "p"
EN 61241-0:2006	Electrical apparatus for use in the presence of combustible dust – general requirements
EN 61241-1:2004	Electrical apparatus for use in the presence of combustible dust - Part 1: Protection by enclosures "tD"

Signed

Keith Hedges
Managing Director

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Control Techniques Dynamics operate a quality management system that complies with the requirements of our BS EN ISO 9001:2008 Registered Firm Approval No.FM30610

EMERSON
Industrial Automation

EC DECLARATION OF CONFORMITY

We, the manufacturer:

Control Techniques Dynamics Ltd. (part of Emerson Industrial Automation)
South Way, Walworth Industrial Estate, Andover, Hampshire SP10 5AB, United Kingdom

Tel: +44 (0) 1264 387 600 Fax: +44 (0) 1264 356 561

Certify and declare under our sole responsibility that the following products:

Name	**Unimotor FM (Fan Blown)**
Description	AC Brushless Permanent Magnet Electric Servo Motors
Catalogue numbers	075U4***************, 095U4***************, 115U4***************, 142U4*************** and 190U4***************

* maybe any number or letter indicating motor options which do not affect this DoC.

+ Added to the right hand side of these part numbers there maybe an additional '-' followed by 4 letters indicating that the motor is a 'special' or has a gearbox is fitted.

Comply with the essential requirements and provisions of the Low Voltage Directive 2006/95/EC and of the EMC Directive 2004/108/EC based on the following specifications applied:

EU Harmonised Standards under directive 2006/95/EC: EN 60034-1:2004 , EN 60034-5:2001, EN 60034-6:1993, EN 60034-7:1993, EN 60034-8:2007, EN 60034-14:2004, EN 60204-1:2006

EU Harmonised Standards under directive 2004/108/EC: EN 61000-6-2:2005, EN 61000 -6-4:2007

Year of CE Marking: 2010

Signed

Keith Hedges
Managing Director

23rd June 2010

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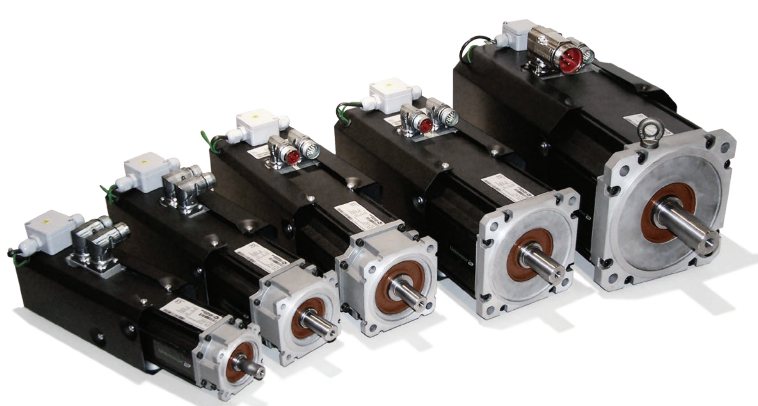

9 General Information

The manufacturer accepts no liability for any consequences resulting from inappropriate, negligent or incorrect installation or adjustment of the optional operating parameters of the equipment or from mismatching the variable speed drive with the motor.

The contents of this guide are believed to be correct at the time of printing. In the interests of a commitment to a policy of continuous development and improvement, the manufacturer reserves the right to change the specification of the product or its performance, or the contents of the guide, without notice.

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